THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1804.] LONDON, DECEMBER 7, 1897. [49TH YEAR. PRICE 6d.

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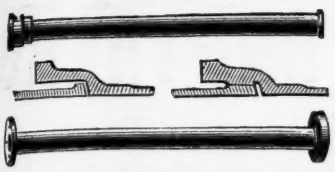
1½ to 12 IN. BORE.



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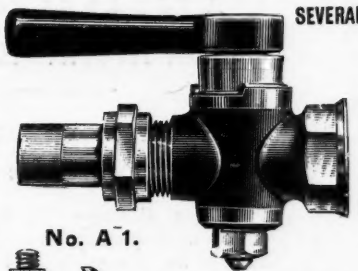

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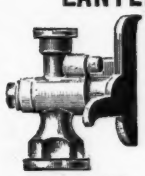

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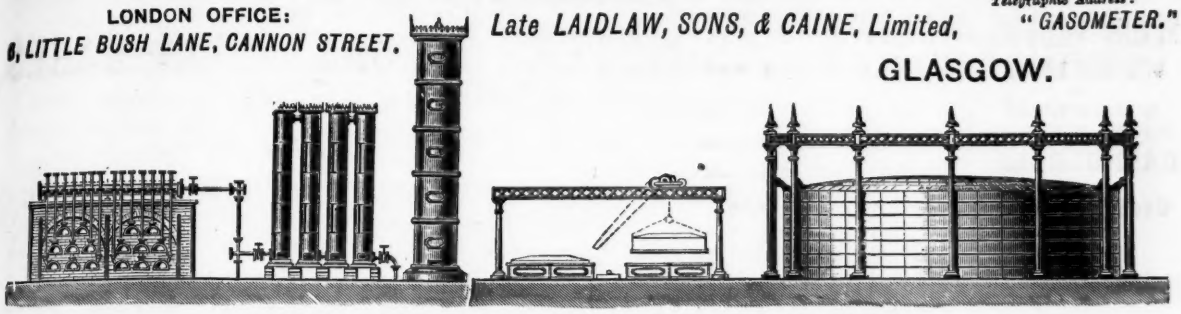

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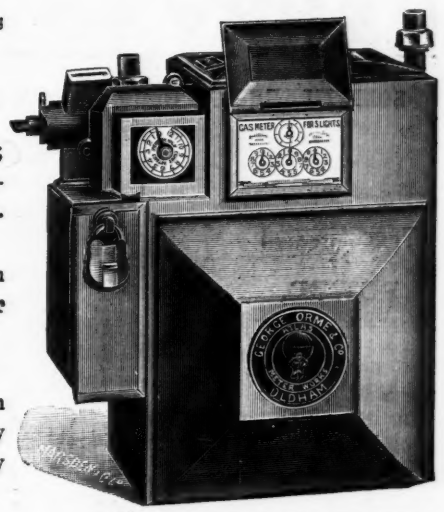

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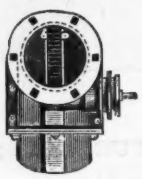

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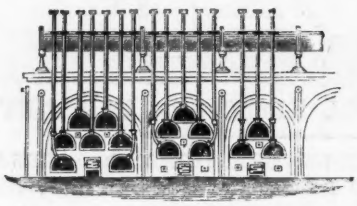

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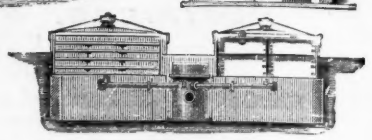

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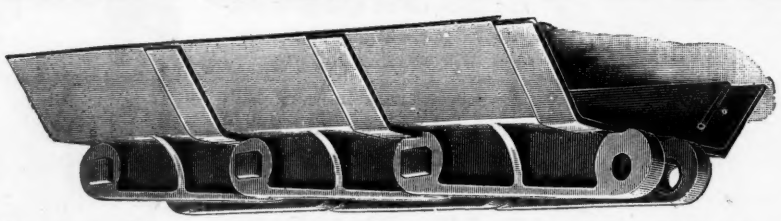

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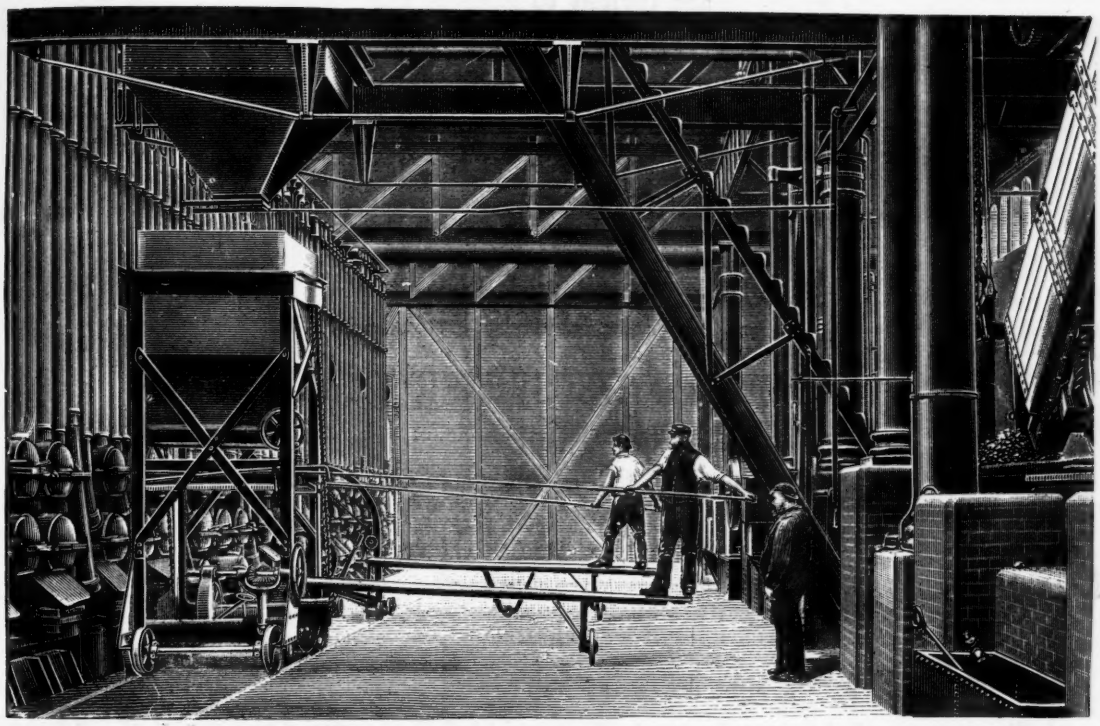

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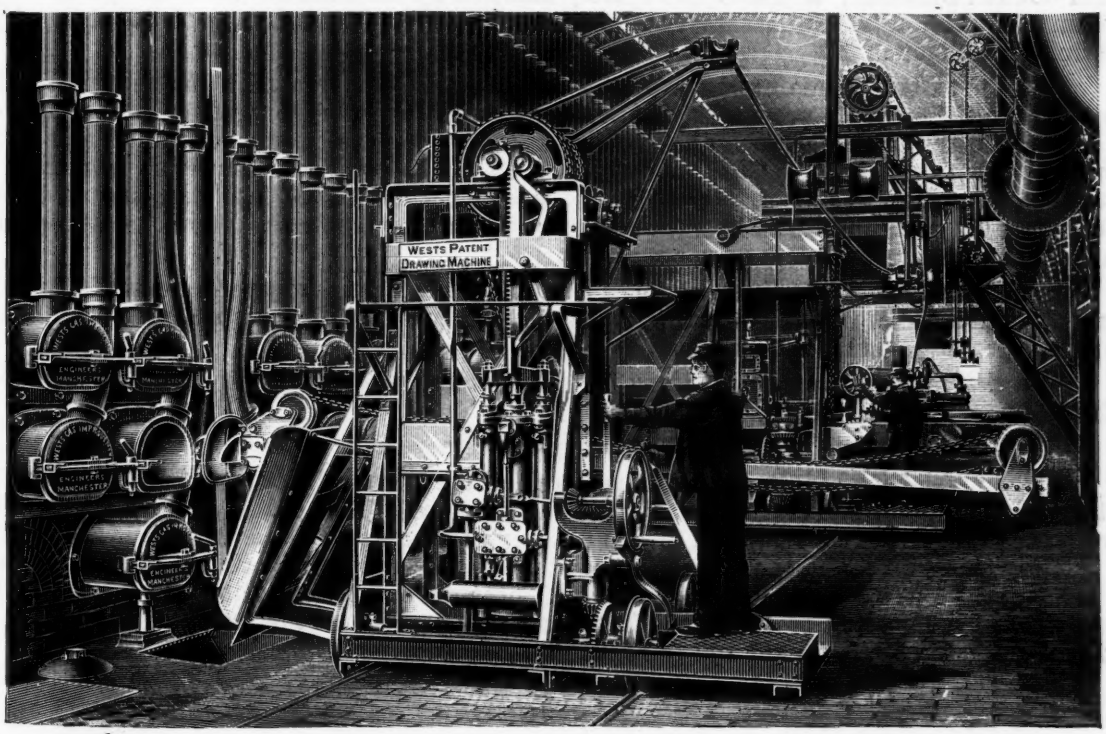

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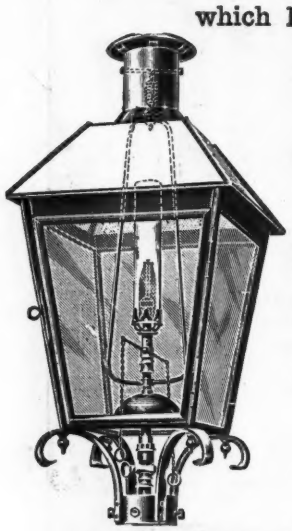

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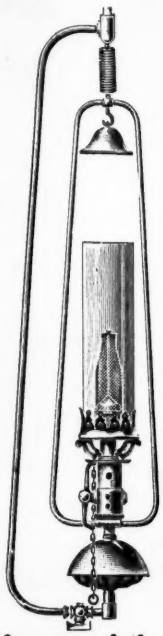

The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

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"The number of lights attended to per man averages 85."

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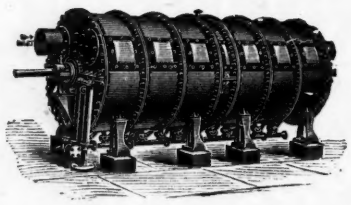

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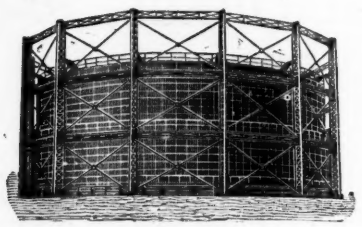

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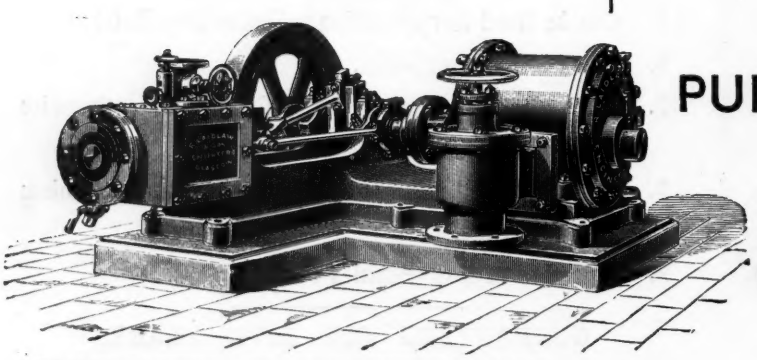

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GAS AND WATER
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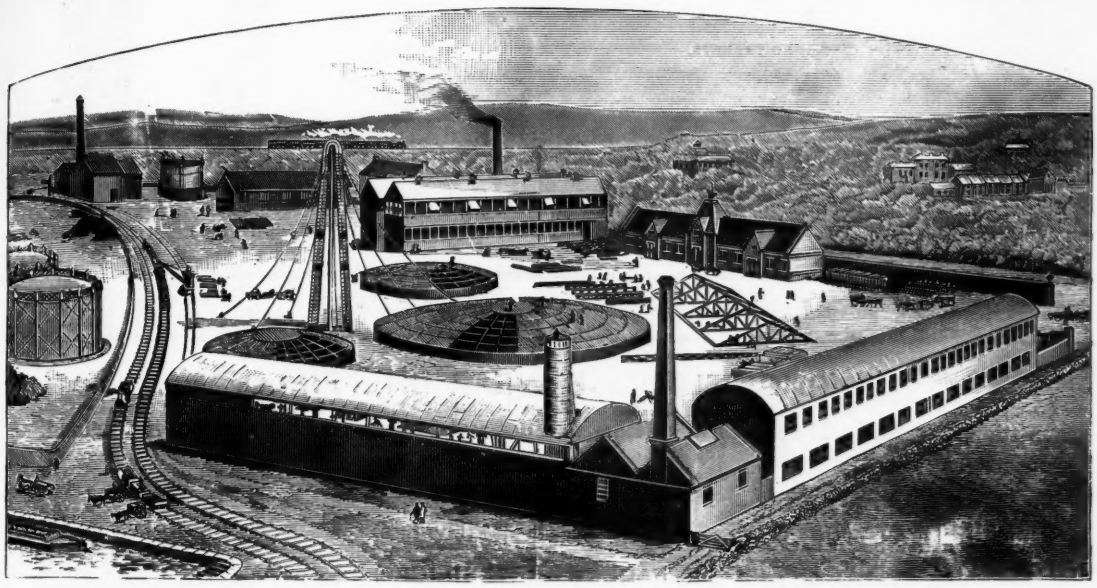

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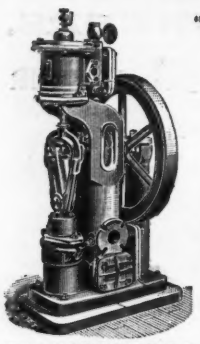

Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

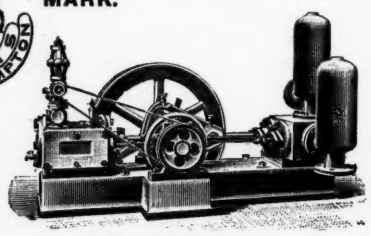

Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

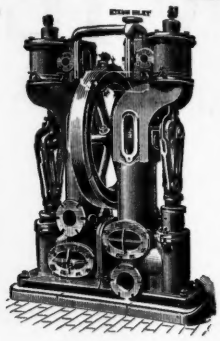

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

THE SILICA FIRE-BRICK COMPANY,

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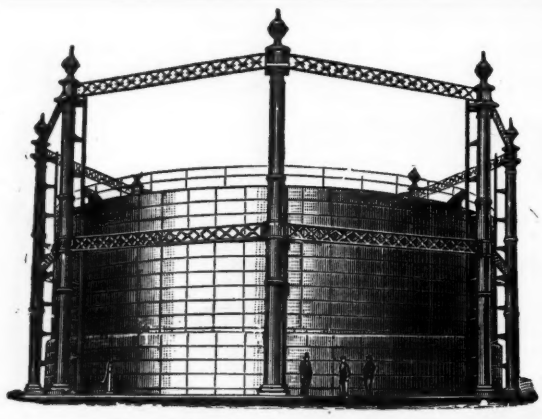

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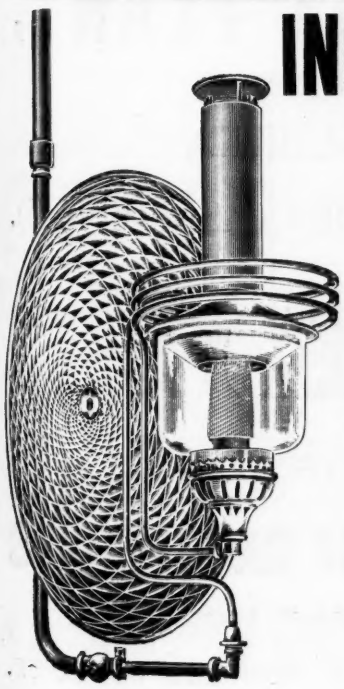

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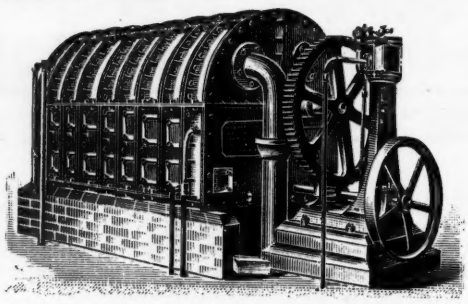

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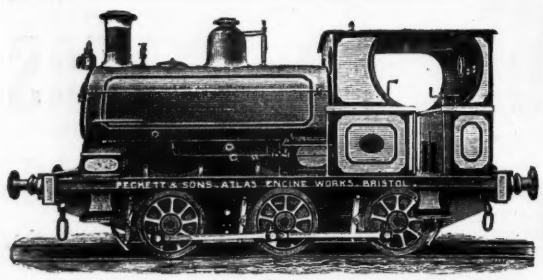

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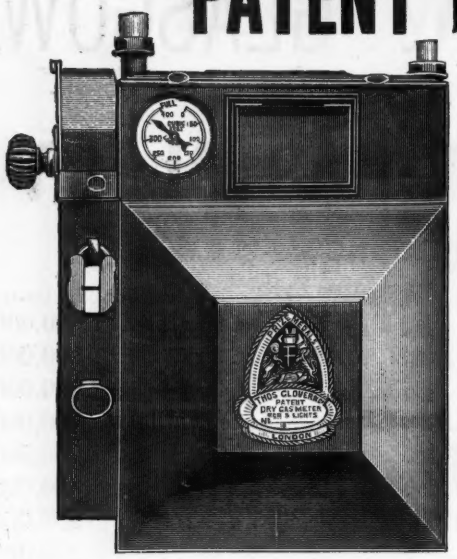

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EDITORIAL NOTES.

The Engineering Strike—Suspension of the Conference.

ON the face of it, the news of the week concerning the engineering trade dispute is bad. The London conference broke up on Friday, and stands formally adjourned until this day week; but whether or not it will meet again then depends on circumstances which cannot for the moment be ascertained. The matter stands thus: The whole of the past week was spent in the endeavour to come to close quarters over the question of works management. The men—or rather, their official leaders—had disavowed any desire to interfere with the management of the employers' business; but when the abstract principle came to be defined in the various concrete applications which the employers regarded as its necessary embodiment, the Trade Union interest kicked against every one of them. Friday's newspapers contained the full text of the employers' proposals in this regard, which really constitute the charter of free works management. We give this matter in another column, as it would occupy too much space here. The proposals cover the points of freedom of labour and employment, the questions of piecework and overtime, apprenticeship, and machine tools and their operation. So far as we are able to judge, the conditions proposed are strictly in accordance with the dictates of equity and common sense. But inasmuch as they do not recognize the Trade Unions in any way, the Union delegates fought them word by word, and offered numerous counter-proposals which the employers rejected. Lastly, the question of the eight-hour day, or 48-hour week, was mooted by the men in the following terms: "That, having regard to the increasing efficiency of "labour due to improved machinery and greater intensity, "the Trade Unions here represented claim the introduc- "tion of an eight-hour day or 48-hour week." To this demand the employers replied in a somewhat lengthy statement, of which it is only necessary to give the sense of the first paragraph, which is to the effect that the claim is inadmissible.

Upon this the men's delegates declared that they must refer the question of accepting the employers' proposals, aye or no, to a vote of their Society members, according to the arrangement made before the conference met. They have therefore issued an address, to the wording of which, it is only fair to say, no objection can be taken. Being Trade Union officials, the delegates were bound to point out that, in their opinion, these proposals "are "diametrically opposed to the first principles of Trade "Unionism." The men are consequently asked to decide between Trade Unionism and employment. Furthermore, the fundamental idea underlying the employers' proposals is rightly indicated as that of "individual bargaining "between employer and workman." As against this is set the Trade Union idea of the standard or minimum rating of workmen by "collective bargaining"—meaning, of course, the recognition of the Trade Union as a party to the settlement of wages and everything else belonging to the conditions of labour. If the men vote for their Union, the Conference will not meet again; and the fight will go on to a finish. It is quite possible that the men may vote in this way. If their present leaders can get at them, this is what they will probably do under the persuasion that the very existence of Trade Unions is the issue. This is not so; the only things about Trade Unionism that would suffer from the men's acceptance of the employers' proposals being the actual management, and the socialistic twist that has been given to the Unions during the past few years. There is no reason why the men should not agree with their employers before the 14th, get to work before Christmas, and set themselves with the New Year to reconstitute their Unions on a sounder basis. If the men can but see it, it is only the New Unionism, as represented by Messrs. Barnes, Burns, and Mann, that is at stake, not the Unionism which is organized self-help according to the principles of common sense, common honesty, and common justice.

It is to be hoped that journalists and politicians to whom the stoppage or resumption of full work in the engineering trade is not a matter of daily bread, as it is to the strikers, will refrain from saying anything that may tend to cloud the issue or exasperate either side. The men may reject the offered terms; but they will have to come

to them in the end if they are to return to their trade at all. How weak the Trade Union case against the employers is may be understood, if any further light upon the point is needed, by a remark in last Saturday's "Daily News." After declaring, in a gentle, ladylike strain, that the employers are really much too hard upon the poor dear Trade Unionists, the writer is fain to assume, "for the sake of argument," that the policy of the Trade Unions is to restrict output. This brings out the brilliant suggestion: "But if this restriction "is as serious as the masters say, surely it is worth "buying off." That is to say, the masters are to compound an industrial felony! If the apologists for Messrs. Barnes and Co. in the Daily Press are reduced to such pleas as this, it will occur to most people that their cause is a lost one.

A Gas Secretary's Complaint.

THE letter on "The Extinction of Gas Companies" which appears in our "Correspondence" column to-day revives a subject of controversy that might have been discussed in similar terms any time these thirty years. The writer is "A Gas Secretary;" and the gravamen of his complaint peeps out in the incidental remark concerning the usual consequence to this class of officials of a gas-works transfer. It is quite true that, when a gas company becomes extinct, the secretary, together with the directors, dies with it. With regard to compensation for loss of office, however, the practice varies. There are secretaries and secretaries, as there are directors and directors; and some of these functionaries are not only deserving of compensation when dispossessed of their places, but are able to see that they get it. There is no doubt that a very great deal depends, as our correspondent justly says, on the adoption by the directors of gas companies of a firm policy in regard to the question of purchase by the local authority. The danger of an error being committed is much diminished when there is a settled policy to go by. The transfer of gas-works to local authorities is not so often done against the will of the proprietors as our correspondent seems to think; and never unless a clear case of expediency in the public interest can be made out. Parliament will not expropriate a gas company merely in order that a local authority may have a surplus of profits to put to the relief of the rates. Local authorities sometimes entertain a fond delusion to this effect; but it is apt to be rudely dispelled by the air of the Westminster Committee-rooms. Gas supply is a business, the proper conduct of which is the first consideration. Where this attribute of efficiency can be shown to attach to the administration of a statutory gas company working under modern conditions, there is small prospect of a local authority being able to dispossess the proprietors against their will.

The Waterford Gas Bill.

IN mentioning last week the Parliamentary Notices relating to Gas Bills for the coming session, we made passing reference to the City of Waterford Gas Company's Bill as containing a proposal to offer the new stock required to be issued by the Company in the first place to the consumers. In view of the importance of the principle, we take this opportunity of reverting to the subject, and explaining more fully what the Company propose to do. Clause 12 of the Bill is to the effect that, before any of the new stock—which is to be a unified 5 per cent. stock—can be sold to the public by auction or by tender, it is to be offered at par to the consumers of gas within the district who shall apply for the same. The consumers are to have a right to an allotment of stock in proportion to the amount of their payment for gas during the preceding year. Thus a consumer of £5 worth of gas or less, will be entitled to an allotment of not exceeding £20 of stock; and so on in the same proportion up to £25 consumption and £100 stock allotment, beyond which the privilege is not to extend. Provision is made for due notification of such stock issue; and at the end of the clause, it is provided that "no stock so allotted and issued to a consumer shall "be sold by such consumer to any person who is not at "the time of such sale a consumer of gas." It is to be observed that this scheme differs in several respects from the abortive proposal to the same general effect of the South Metropolitan Bill of 1895, and which was thrown out partly on this issue. The South Metropolitan consumers were to have an option of acquiring the new gas stock at the market price of the day; while the Waterford consumers are to take it, or leave it, at par. Then there is the restriction against transferring the Waterford stock to anybody but gas consumers. This and the terms of the issue practically make it a special consumers' stock. The restriction operates in the sense of taking the point out of Mr. Worsley Taylor's argument against a like proposal in the South Metropolitan case; but the two modifications together can hardly have any other effect than that of making the value of the Waterford consumers' holdings slightly different from that of the remainder of the consolidated stock, old or new. We do not offer any opinion upon the expediency or otherwise of this probable result of the acceptance of the Company's offer as it stands in the Bill. It may be freely acknowledged that the proposal is a public-spirited attempt to secure a wide popular basis for the Company in the district served by the undertaking, and, as such, is to be commended.

Electrical Power from the Coal-Fields.

IN another column particulars will be found of an interesting innovation in British industrial methods. Two Companies have given parliamentary notice of their desire to be incorporated with statutory facilities for the purpose of constructing electric power stations on a large scale. The idea is, in brief, to repeat in this country the Niagara power scheme, with the difference that the source of energy at the central station is to be the store of cheap fuel with which certain coal-fields are glutted. We understand that the promoters of these schemes really mean business, and have at command all the capital they need for carrying out their plans. If there is anything at all in the electric transmission of power to a distance, as at Niagara, there is no reason why these schemes should not attain an equal, or even a greater, success than the much-advertised speculation referred to. Steam power can be generated at scores of places in our own Black Countries—both Northern and Midland—at a far less cost than that of tapping Niagara. Heaps of slack and smudge coal exist in these regions which would not pay to cart a few miles, but would serve admirably, with mechanical stoking and Lancashire boilers, to generate steam for almost nothing. Besides, there is the possibility of coking, and the utilization in the same way of the waste heat of this manufacturing process. Of course, it is not for us to say anything about the prospects of the electrical part of these projects; but we do not entertain the slightest doubt that what can be done at Niagara can be done to even greater advantage in (say) South Staffordshire. Even in Lancashire, at the mills situated in the towns, the cost of steam power is considerably less than the price charged for power by the Niagara Company. The prospects, therefore, of a steam-generated electricity-supply undertaking, such as these parliamentary notices provide for, would appear to depend entirely upon considerations other than those of the first cost of the power. It will be vastly interesting to watch the development of this enterprise. Many a man has proposed that gas-works should be shifted to the coal-fields instead of bringing the coal to the gas-works; and now we have the same idea mooted with the imponderable electricity as the subject of experiment. There is perhaps a better prospect for electricity in this regard than there ever was for gas; and we shall not be jealous if the new-comer justifies the modest hopes entertained by its partisans.

The Meeting of the Royal Society.

THE annual meeting of the Royal Society was held last week, under the presidency of Lord Lister; and the anniversary dinner followed. In his address, his Lordship referred to the losses sustained by the Society through death during the past year; making special mention, among other deceased members, of Dr. Edward Ballard, who served the country well as one of the leaders of modern sanitary science. Dr. Ballard's report to the Home Office upon the effluvia of gas-works created much interest at the time of its publication. He had a good deal of influence over the course of legislation relating to the amelioration of so-called noxious trades. Lord Lister mentioned the part taken by the Royal Society in urging upon the Government the importance of establishing in this country a national physical laboratory, in which the testing and verification of instruments and the construction and improvement of standards of various kinds should be undertaken in a regular and systematic way. He was glad to be able to state that the efforts of the deputation which urged this cause before Lord Salisbury were not altogether in vain.

A Committee, with Lord Rayleigh as Chairman, has been appointed by the Treasury to investigate and report upon the desirability of the scheme. Evidence is being taken; and it may fairly be hoped that the Government will finally consent to promote an undertaking which cannot fail to advance the interests both of pure science and of scientific industry. At the dinner, the Government were represented by the Duke of Devonshire, who had the pressing question of technical education in his mind when he remarked that "recent discoveries of science and their "practical results have had so profound an influence on "the social condition of all the peoples of the world, "uncivilized as well as civilized—they have had, and are "having, so great an influence upon the industrial pro-"gress, and therefore upon the growth or decline of "nations—that it is almost impossible that some know-"ledge at least of the results, if not of the methods, of "scientific discovery should become almost as indispens-"able a part of the training of statesmen as the knowledge "of the instincts, the passions, and the interests of the "people to which their studies have hitherto been almost "entirely, or at any rate mainly, directed." A really noble saying, and a true one, too. Perhaps at some period after statesmen have agreed upon the importance of the dissemination of science, the electorate may come to perceive it; and then the country will get the scientific teaching it needs and deserves.

The Infringement of Patents by Importation.

An important House of Lords decision was delivered last week in the case of the *Badische Anilin und Soda Fabrik v. Basle Chemical Works Bindschedler*. The story involved in this case is one that might be supposed to cause the would-be reformers of the British patent system to blaspheme, inasmuch as it throws into prominence several of the most familiar of their grievances. We gave the particulars in the "Journal" for April 13 last, and to these readers are referred. Briefly, it was a question whether a foreign manufacturer of an article patented in Great Britain by somebody else, can be restrained from supplying the article to the order of a purchaser residing in this country. In this case, the article was a coal-tar dye marketed under the name of "tartrazine." The Badische Fabrik are the patentees of the dye in this country; but it is also manufactured in Basle, Switzerland, by the Bindschedler firm, who supplied a parcel of it to the order of Messrs. Henry Johnson and Co., drysalters, of London. Upon hearing of this transaction, the patentees took action against both the sellers and buyers of the goods. The latter confessed judgment, and submitted to an injunction; the former appeared with the object of having the question tried. It must be borne in mind that the goods were posted in Basle, outside the jurisdiction of the English Courts, and delivered in London in due course. It was argued in the Courts below that by setting in motion an agency such as the Post Office, which undoubtedly completed its operations within the jurisdiction, the foreign seller brought himself within the scope of the English law. The Judge who first tried the case thought so, and granted the injunction as prayed. The majority of the Court of Appeal, however, reversed this decision last April; and now the House of Lords has confirmed the judgment of that Court. They have done so, moreover, upon the clearest and simplest of legal grounds. It is, said the Lord Chancellor, "well-settled law that, when goods are consigned to a "named agent for delivery to a purchaser, the agent "becomes the agent of the purchaser and not of the "sender." The fact of the agent in this case being the Post Office makes no difference in the principle. Hence the English Courts have no jurisdiction over the foreign manufacturer who supplies to the order of a British purchaser. The latter is alone amenable. This decision does not improve the position of the British patentee, who will have to keep a sharp look-out upon importers.

American Cast-Iron Pipes.—According to the "Ironmonger," the American manufacturers have secured a large order for cast-iron pipes for China. They will be conveyed 2400 miles by rail in the United States, then 4000 miles by sea to Tientsin, for a through rate of 30s. per ton, whereas English pipefounders would have to pay nearly double this amount for the all-sea rate to the same destination. Our contemporary learns that there is in the market an order for 8000 to 10,000 tons of pipes for Japan, and expresses the hope that English founders will make an effort to distance the Americans in respect of this contract.

WATER AND SANITARY AFFAIRS.

Lord George Hamilton, in the course of his address at the annual meeting of the London Municipal Society last week, glanced at the Progressive policy as shown by the proposal to acquire the property of the Water Companies. This was put in contrast with the policy on the Moderate side; and the argument so framed was adopted by "The "Times" in its leading columns on the ensuing day. In a vigorous and interesting article, credit is ascribed to the Moderate party for having exercised sufficient influence to effect "a very marked improvement" in the general policy of the County Council, a notable check having been given to the aggressiveness which was formerly conspicuous. We confess to a little reserve on this point. Among the good results effected by the Moderate party, we are told that "instead of a headlong plunge into the gigantic under-"taking of bringing water for London from the Welsh hills, "they have obtained the reference of the whole question to "a Royal Commission." In this respect, however, we must look upon the Moderate party as operating outside the limits of the County Council. The Council have no love for the Royal Commission, and did nothing to promote its constitution. We can only say that there is an agreement between the appointment of the Commission and the policy of the Moderates. But there is a statement in the editorial article of "The Times" which deserves particular notice, as scattering an entire host of mischievous aspersions. Thus we read, respecting the quality of the water, that, the Commission being set on foot, "London is in the "meantime continuing to enjoy an abundant and unex-"ceptionable supply." The article goes on to say that the reasonable aspect now assigned to the Water Question in London is to be reckoned among other "substantial "successes and benefits for the community which may "well encourage the Moderate party to work steadily for "the consolidation of their position." In view of the intended redistribution of power, it is urged that the Moderate party in the Metropolis should bestir itself to secure full and adequate representation upon the County Council to be elected in March next, "since it can in no other way "so effectively assist the Government." As for the Royal Commission, it evidently has a long task before it, and by the time it concludes its labours important changes will most likely be impending, if not accomplished, in respect to the government of London. In such contingencies, the water supply is itself involved. The peculiar extent to which the Corporation of the City are interested in this matter has perhaps been somewhat overlooked; but it was exemplified at the meeting of the Court of Common Council last Thursday, when the County Purposes Committee presented a report showing that as the City paid one-eighth of the entire rates of the Metropolis, so it would have to bear one-eighth share of any outlay incident to the purchase of the interests of the Water Companies. The views of the Corporation are to be laid before the Royal Commission; and it will be interesting to see how far the Corporation are going to maintain an alliance with the County Council on this subject. If water is ever to come from Wales, how will the pockets of the City ratepayers be affected?

The remarks made by Mr. Idris as to the state of the Thames and the conduct of the Conservators, have given rise to a correspondence which figures rather largely in the report of the General Purposes Committee, to be presented at to-day's meeting of the London County Council. Mr. Idris was originally reported to have said that, "it was "difficult to get the Conservators to take proper action, "because the River Purification Committee of that body "consisted very largely of people interested in the land "in the Thames Valley, and who thought it unjust that "they should be compelled to purify at their own cost the "effluents, in order to provide drinking water for London." Mr. Idris now gives a different version of his speech, saying that the Thames Conservancy Board is "controlled "or influenced very largely by people interested in land "in the Thames Valley." But he continues to accuse the Conservators of neglect of duty, and makes complaints as to the condition of the Lea, as well as the Thames. He has addressed a long letter on the subject to the General Purposes Committee; and the latter recommend that a copy should be sent to the Thames Conservancy Board.

Last week we offered some remarks on two important Water Bills directly affecting the Metropolis. Among the

provincial projects, there are signs of a singular contest over the Todmorden water supply. The Rochdale Corporation are prepared with a Bill for the acquisition of the undertaking of the Todmorden Water Company; the purchase to be followed by the dissolution of the Company, and the existing works to be maintained and extended. But there is another party in the field, consisting of the Corporation of Todmorden, who desire to purchase the Company's undertaking, either compulsorily or by agreement, and to acquire the exclusive right to supply water within the borough of Todmorden and certain named parishes. As it happens that the Rochdale Corporation are already supplying water to a portion of the Todmorden area, power is sought to extinguish such right. The Todmorden Corporation are so thoroughly in earnest, that they have two Bills in hand—one for the transfer of the Company's works, and another to make and maintain new works; power being sought to extinguish the right of supply by other parties. The Todmorden Company will apparently have the chance of selling to the highest bidder. The Tynemouth Corporation seek authority to carry out their extensive scheme of water supply from the River Font, in connection with which they ask for power to supply other authorities and bodies whose districts are situated in the vicinity of the intended works. The Corporation of Carlisle propose to take a supply from the River Gelt and its tributaries. Near London we have the Wey Valley scheme, devised for the dissolution of the Wey Valley Water Company, Limited, and the incorporation of another Company, with power to supply water to certain parishes in Surrey and Hampshire. A species of amalgamation forms a conspicuous feature in this scheme; authority being sought for as many as seven Companies to enter into agreements with each other—the localities concerned, in addition to Wey, being Frimley, Farnham, Aldershot, Woking, Wokingham, and Frith Hill. The Mid-Kent Company desire extension, and for this purpose seek to be dissolved and re-incorporated, with wider limits of supply. Power is sought to prohibit the sinking of wells within the Company's area. This is very natural—or, perhaps we might say, very necessary—in a chalk country. But there is greater liberty in London, where chalk-wells abound; the Corporation of the City making great boast of one which they constructed on their own property a few years ago.

The General Private Bill Business for the Ensuing Session.—The time expired last Tuesday evening for the deposit at the Private Bill Office of the House of Commons of plans and other documents in relation to the Private Bill business for next session. The total number of notices of applications for Bills and Provisional Orders is 335, compared with 293 last year.

North British Association "Proceedings."—We have received from the Hon. Secretary of the North British Association of Gas Managers (Mr. R. S. Carlow, of Arbroath) a copy of the report of the thirty-sixth annual meeting held at Ayr last July, under the presidency of Mr. Alex. Bell, of Dalkeith. Combined with the report, as in recent years, is the "Statistical Report of the Gas Supply of Scotland from July 31, 1896, to Aug. 1, 1897."

Calvert's "Mechanics' Almanac and Workshop Companion" for 1898, a copy of which we have received from the publisher, Mr. J. Heywood, of Manchester, is the 25th annual issue; and therefore the work may be said to have established itself in the favour of those for whom it is specially intended—viz., artisans and handicraftsmen, and those who are generally engaged in mechanical, engineering, and building and constructive trades. It is compiled and edited by Mr. J. Nasmith, M.Inst.M.E., the Editor of the "Textile Recorder."

The Measurement of High Pressures.—A reprint, in pamphlet form, of a series of papers on "Apparatus for the Measurement of High Pressures," by Dr. H. F. Wiebe, one of the Editors of the "Zeitschrift für Heizungs-Luftungs-und Wasserleitungstechnik," has been forwarded to us. The papers describe a shortened type of open mercury pressure-gauge for the measurement of high pressures, and several patterns of high-pressure gauges which have been employed for high-pressure cylinders, &c. The treatment of the subject is thorough and capable.

The Explosibility of Acetylene Gas.—According to a communication by Professor Mixter to an American scientific magazine, acetylene gas under a pressure of one atmosphere does not explode when a spark is applied to it, neither does it do so under two atmospheres; but under three there is a sharp explosion, the violence of which increases with the pressure. Hence the law that the rate of decomposition increases with the pressure. These facts are the result of an examination of acetylene gas by Professor Mixter; and from his investigations it is concluded that, when used with care, acetylene is no more liable to explosion than illuminating gas; but should such an explosion occur, results would doubtless be more disastrous.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1247.)

Signs that Christmas is coming are apparent in the Stock Exchange, as in other places. Business is getting quieter and quieter. In the earlier part of last week, an additional check to business was provided by telegraphic interruption owing to the gale. But apart from this, the public continue very listless, or cautious, or in that frame of mind—whatever it may be—that keeps them outside the Exchange. They have plenty of money; and they will buy Consols and other choice stuff (at least those who can afford them), but anything else has no attraction. Still, prices keep up very fairly, except in those quarters where actual and anticipated labour troubles press heavily. The Money Market had a good week; there being a strong demand. Rates are firm, and are likely to last the year out. While the other departments were mostly so idle, Gas securities were quite up to what might fairly be expected in point of activity, and, indeed, rather more so. In Gaslights, the "A" opened with a still rising tide; and on Tuesday it changed hands more than once at 319½ (three weeks ago it touched 303½). But from this point, a reaction set in; and realizations threw it down as low as 315½ on Thursday. The fall stopped here, however; and the last few marks were at better figures—the quotation closing the same as the previous week's. The secured issues were rather inactive, but strong—the 10 per cent. preferences especially so; while the "H" 7 per cent. maximum advanced a point. At the Mart on Tuesday, £30,000 of 6 per cent. debenture stock was sold by order of the Directors, and realized the nice average price of 207½. A fair amount was done in South Metropolitan; but the price was not very good—just about strong enough to keep up to middle figures. A little was done in Commercials, at prices unchanged. Business in the Suburban and Provincial division was extremely inactive. Good firm prices, however, were the feature, though quotations did not rise. The Continental Companies, too, were quiet; but they were in good favour. Imperial pushed up another couple of points; European also rose; and Union fetched figures which looked promising. None of the rest did anything calling for remark, except Bombay, which had a rise. A fair amount of business, all things considered, was done in the Water Companies, at good steady figures; all quotations closing without any variation.

The daily operations were: Gas stocks opened on Monday brisk and buoyant, especially Gaslight "A," which made an advance of 2. Things fell quiet on Tuesday after the activity of the previous day; and quotations did not move. Wednesday showed a little recovery in point of activity, South Metropolitan being the busiest; but the turn was against Gaslight "A," which lost 1. On Thursday the battle raged chiefly over Gaslight "A," which receded 1 more; but Imperial advanced 1, and Bombay ¼. Gaslight "A" was again in the thick of it on Friday; and the price rallied a bit. Imperial advanced 1; and European fully paid, ½. Saturday was quiet, and devoid of feature; but Gaslight "H" rose 1.

ELECTRIC LIGHTING MEMORANDA.

The Story of Ealing—A Heavy Coal Bill—The Futility of Dust Destructors—The Mystery of Shoreditch.

At the close of last week's "Electric Lighting Memoranda," it was intimated that the example of the Ealing Electric Lighting undertaking would be discussed this week. In truth, the case of Ealing is a typical one; pointing in the most emphatic style the moral of our article last week. Ealing is a straggling half-built suburban district stretching away to the extreme west of London. In 1894 the District Council opened their electric lighting works, which were laid down, under the supervision of Messrs. Bramwell and Harris, at a cost of £26,000. The generating station was placed next door to the Council's sewage works; and great things were expected of the economies that were to be realized by utilizing the heat of the destructor furnaces. In order to start with some sort of connection, the Public Offices, the Free Library, and one or two of the main streets, were lit up from the beginning. This, of course, so far as the District Council were concerned, was paying money out of one pocket into another; but where would most of the municipalized electric lighting undertakings of the country be if this help were withheld from them? So, at any rate, the Ealing concern started; and then the District Council made a rate-in-aid, and sat down to wait for custom. They are still waiting. Three years have passed, the capital expenditure has very nearly doubled itself—to be precise, the figure stood at £49,813 at the close of the last municipal year; and there was an admitted deficit in revenue account of £1662. To this should be added whatever excess over the previous gas bill the Council incurred in order to help the undertaking; and this brings the year's burden upon the ratepayers to the estimate of £4000 given by us last week. And even then there is no provision made for any depreciation. The system of supply is the high-pressure

alternating; and some fine day the electrical adviser of the Council will report that plant and cables want renewing, and there will be no money to do it with.

A remarkable feature of the Ealing station accounts is the heavy coal bill, which works out to 1·84d. per unit sold—a very high figure indeed, as compared with the average coal-fired station, and throwing a lurid light on the question of refuse destructor heating. It is not this, however, that renders the Ealing undertaking unprofitable, though the revenue account is, of course, seriously weighted by so heavy a charge for fuel. Neither is the capital very extravagant. The weakness lies in the lack of a sufficient amount of paying business. The dynamos have an output capacity of 458 kilowatts; and the maximum demand has only been 189 kilowatts. The station could easily do half as much work again as it has to do. If the undertaking could work at half cost, or double its business, it would begin to pay its way; but it is hardly too much to say that it will never cease to be a burden to the ratepayers. After three years it is pretty easy to tell the fortune of any electric light undertaking. It is just this period that local authorities meditating embarkation upon such a venture would like to be able to forecast. If this were possible in all cases, we may be sure that many a station now in existence would never have been built.

The particular lesson of Ealing, however, is the one which we so often try to drive home in this column—that no dodgery of dust destruction is of avail in the experimental solution of the problem of economical electricity supply. The same lesson is being slowly, but surely, extricated from the questionable statements put in circulation respecting the working at Shoreditch, where the world was to see such wonders. We averred from the first that the coal heap at the Shoreditch station would be of about the same size as if there were no dust destruction going on in the vicinity; and recent correspondence and reports in the "Electrical Review" go to indicate that we were not far wrong. No sooner had the Shoreditch station started, towards the end of the summer, than the newspapers were duly informed of the fact that the house refuse was doing all the work. Of course, there was not much to do; but by the middle of October it began to be understood that coal was going into the station pretty freely. Thereupon somebody claiming practical experience in such matters wrote to the "Electrical Review" protesting against the idea that the station could ever have been expected to work without coal. "To suggest, or expect, that electric light stations of any importance can be worked by burning household refuse only, no matter the quantity available, is a gross absurdity," said this correspondent. Thereupon another critic of the Shoreditch practice—Mr. J. Beresford Bolton—wrote to say that the Shoreditch refuse is of a peculiarly combustible character, so that any results obtainable from it would not be a guide for other localities. This statement was endorsed by a subsequent writer, who suggested that those engineers and contractors who are going about the country touting for orders on the strength of the alleged economy of utilizing the heat of dust destructors, should be made to sign a guarantee to pay for any coal that might be required to assist the rubbish fuel.

Mr. J. Beresford Bolton returned to the charge in the "Electrical Review" for the 12th ult., stating that, having watched the erection and development of several of the municipal electrical undertakings in different parts of the country, and after careful observation, he has decided that it is a great mistake to make the efficiency of an electric light supply dependent upon the successful working of a dust destructor and the steam-generating qualities of towns' refuse. He points out that even at Shoreditch, under the most exceptionally favourable conditions as to plant and material, before the evenings had drawn in to any great extent "we hear that it is found necessary to burn 30 tons of coal a month." These criticisms brought a letter from Mr. H. E. Kershaw, Chairman of the Shoreditch Vestry Electric Lighting Committee, who evidently thought he had only to make a statement in order to quell all murmurings. Mr. Kershaw began by declaring that he was "nearly tired" of continually contradicting the "absurd reports" about Shoreditch and the fuel question which found their way into the papers. He went on to state that the ashbin refuse actually does drive the electric light plant, to a maximum load of 250 kilowatts, and that coal is only used to get up steam at the week-ends, when the carts cease collecting. Unfortunately for Mr. Kershaw, his protest was a little too precise in terms, and somewhat too aggressive in tone. The "Electrical Review" editorially confessed its inability to account for the admitted coal consumption of the Shoreditch station on the "week-end" theory. A correspondent was unkind enough to remark that Mr. Kershaw will probably be not "nearly," but quite, "tired," before he has done with the subject. Seeing that the system adopted at Shoreditch is being "boomed" all over the country by interested parties, it is suggested that the Chairman of the public body responsible for what is going on ought to realize the position. Another inquirer boldly declares that "there is an impression abroad that the system of power generation at Shoreditch is not by any means an economical one, but is both *dear and nasty*." And certain data are demanded with the object of proving or disproving the contention that the very heavy first cost of the Shoreditch plant, and the great depreciation it must bear under the working conditions, make the cost of running very much higher than that of a modern coal fuel, gas, or steam power plant. Up to the time of writing, these data are still wanting; but an unofficial statement has appeared to the effect that the house refuse of a population of 146,000 people, amounting to 100 tons per day, goes to the production of 250 kilowatts of electrical energy.

BIRRELL ON THE LAW OF EMPLOYERS' LIABILITY.

We left off last week the study of Mr. Birrell's book on "The Law of Employers' Liability" at the close of the lecture on "Employers' Liability at Common Law;" and we resume it now at the beginning of the author's second lecture, which deals with the law as modified by the Act of 1880. Mr. Birrell turns his attention again to the doctrine of common employment, already partially discussed—in more than one sense; and he observes that "it was this last-named doctrine, and the lengths to which the Judges carried it, that first aroused the discontent of the leaders of the Trade Unions now first escaping from the meshes of the law of conspiracy." Mr. Birrell permits himself to refer to the case in which, as he puts it, "the certificated manager of a mine was allowed to kill a miner with impunity." We should hardly have thought this a judicial way of stating the matter. The case of the miner was clearly a hard one; but it might have occurred to Mr. Birrell that such hardships are not unknown in connection with the operation of other branches of the law. However, a movement for reforming this hard law of master and servant was set on foot; and in due course the Act of 1880 was passed. Mr. Birrell falls foul of our national system of making statutes to run side by side with the common law; and he complains in particular of the wording of the title of the Act of 1880. Doubtless the language is open to criticism; and it must be regarded as fortunate for the country that Mr. Birrell is now in Parliament himself. Henceforward no slips of style on the part of the Government draftsman will be able to pass the stern censor who sits for West Fife. The Act speedily came before the Courts for interpretation; and Mr. Justice Cave, in *Griffiths v. The Earl of Dudley*, had the task of deciding what rights the new law actually conferred upon workmen. It was held that "the legal result of the plaintiff being a workman shall not be that he has impliedly contracted to bear the risks of the employment." But the first clause of the Act, to which this interpretation is attached, explicitly says that an injured workman shall have the same claims upon the employer as if he had not been a workman. What, then, is he; and what are those claims? The law merely makes a stranger of him—little better than a trespasser. If the terms of the first clause of the Act were read by the Courts in this sense, then an injured workman would only be invested with the meagre rights belonging at worst to a trespasser, and at best to a bare licensee.

This, then, according to Mr. Birrell, is the total outcome of the Act. "It says that in certain cases and in certain circumstances Lord Abinger's doctrine shall not deprive an injured workman of his right to damages." It is carefully pointed out that seamen, sea apprentices, and domestic or menial servants are not within the provisions of the Act. The lecturer next undertakes to examine the specified cases to which the doctrine of *Priestley v. Fowler* "need no longer apply." This expression is important, "because unless the workman avails himself of the Act, it does still apply." We then get a lesson in the proper treatment of an Act of Parliament of this character. It is to be literally cut up into little bits, in order that the qualifying sub-sections may be pasted by the places in the text into which they are to be read. "Unless you do this," says Mr. Birrell, "the Act defies you." It would not be fair to the author to repeat here the result of this treatment of the Act of 1880; because this is one of the points for which the book is worth buying. Suffice it to say that he handles in a masterly fashion the "five specified cases" in which the statute alters the common law. In regard to the litigation that has occurred since the passing of the Act, which has had the result of producing "cases enough to cover the Act as it were with a cloud," Mr. Birrell pertinently remarks that if liability is to depend on negligence it must be determined by circumstances. He thinks that, on the whole, the Judges have given the Act a fair chance, though some County Court Judges are accused of being hostile to it; and he does not regard as extraordinary the amount of litigation it has occasioned. As compared, for instance, with the Acts relating to bills of sale, the Act of 1880 is "quite a model of lucid draughtsmanship." By the way, should not this be "draftsmanship?" Mr. Birrell rejects the latter form; and he ought to know.

On the whole, Mr. Birrell's opinion concerning the Act of 1880 is, in the main, imbued with thankfulness that it is no worse. He doubts whether it carries out to the full the recommendations of the Parliamentary Committee of 1876. So far as the Act provides for the responsibility of the employer in the case of persons to whom he had delegated his authority, it does all the Committee advised. But the author thinks it was intended by that body "that the doctrine of common employment should be severely restricted to those cases where the servant had an opportunity of observing and complaining of the conduct of his fellow-servant. The Act contains no such general restriction, although no doubt it goes a long way in that direction." With reference to the lawfulness of "contracting

out" of the Act, this stands upon the judgment in *Griffiths v. The Earl of Dudley*. When the lectures were delivered, the Act of 1880 was the only statute that existed to notify the common law of the subject; but since then the Workmen's Compensation Act has been passed.

Mr. Birrell's third lecture was devoted to foreign law and systems of insurance of workmen. Generally speaking, the law of negligence, of which the law of employers' liability is but a branch, is the same on the Continent of Europe as it is in England; but "nothing is known abroad of the doctrine of common employment." The Continental tendency is, however, to translate the legal responsibility of the employer into a system of compulsory workmen's insurance. This has actually been done in the German Empire; but what will be news to many readers of Mr. Birrell is his explanation that this German law, of which so much has been heard, is only a development of systems that had long been recognized in many of the small old German states. The treatment of the system is sympathetic; and the author's judgment upon its working during the past ten years is that this has been, on the whole, satisfactory. Upon this issue, however, a little more critical examination might have been expended with advantage.

The most brightly-written portion of the book, as might be supposed, is that devoted to what was at the time "the New Bill," and is now, with some modifications, the Workmen's Compensation Act. Here the rigid accuracy required of the law writer may legitimately be tempered with the lively fancy of the forensic politician. Mr. Birrell saw in the new Bill a scion of the old dogma *respondeat superior*. This dogma was limited by the other dogma of common employment. As the author puts the combined effect of the two dogmas: "If my cook scalds the butcher's boy, I pay; but if she scalds her kitchen-maid, I do not pay." When he comes to investigate the practical operation of these doctrines, the author finds that the process of arriving at decisions under their guidance takes time and costs money. Costs! There is the red rag that has made John Bull furious with the law and lawyers. Here Mr. Birrell interposes a wise observation. He bids his public understand that if the "aim is to bring out the truth, to discuss the facts, to consider surrounding circumstances (and surrounding circumstances there will always be, despite the impatience of Parliament), to adjust moral claims, and to fix responsibility, the process will always cost money, and, if it is done properly, take time." Nevertheless, as soon as ever Mr. Asquith's Bill of 1893 came under the reproach of being a measure to enable lawyers to make costs, it was doomed. Mr. Birrell very properly praises the abortive Bill; but he easily passes on to approve of the wider principle of the new Bill, which assumed as indisputable that responsibility of the employer which Mr. Asquith would have made the workman establish by an action at law. Much—indeed, the whole—of his criticism of the provisions of the measure is out-of-date; but it is as good matter as ever. It does occur to a present reader of the book, however, that in preparing his lectures for publication in permanent form, the learned author would have done well to have added a supplement dealing summarily with the position created by the passing of the Act of this year. It is not as if the law remained precisely where he left it last spring, though, of course, it has remained unaltered in many of its most important aspects. And why publish the Bill as an appendix, when the Act is available? After all is said, however, the fact remains, to which we are pleased to bear witness, that no man can lay down this little book after reading it comprehendingly—as he must do if he once begins it—without feeling that he knows a good deal more about the subject than he did before.

SOME RECENTLY DISCOVERED CONSTITUENTS OF COAL GAS.

THERE may appear to be many more promising subjects for chemical research at the present day than coal gas, which has been studied for a century past by men of science, and for more than half a century by trained specialists. Yet the one class of observers turned from it, after a comparatively superficial examination, to fields of research which promised an earlier harvest of more showy fruit; and the specialists have found their time fully occupied with the multitudinous problems and the routine work incidental to the control of a rapidly advancing industry. Strange though the fact may appear to those unfamiliar with the subject, we are therefore still in a position of slightly qualified ignorance regarding the composition of common coal gas.

Tar, the bye-product of the gas industry, has been far more thoroughly investigated than coal gas; and some 200 components have been traced in it. Not many more than one-tenth this number of constituents have been identified with certainty in coal gas, though it is well known that many others must exist in it. For instance, we are aware that there are a great variety of hydrocarbon compounds in coal gas; but probably not more than a dozen could be said to have been clearly recognized therein. Quantitative research has been even more neglected; and approximate results only have been found for two or three of the more important hydrocarbon constituents of coal gas. The reason of the lack of close investigation of the gas, may be the difficulty of analysis of gaseous mixtures of more than moderate complexity. But a minor cause is undoubtedly the prevalent impression that the results of deeper research would have no commercial value. That this idea is not justly tenable must be admitted, if a thought is bestowed on the present hazy state of our views on the illuminating constituents of gas and the relation of the latter to enriching gases, and on the great worth of some constituents of other complex mixtures—such as coal tar—of which they form a trifling proportion, but are by no means the least valuable components.

Berthelot is one of the few chemists of great ability in research work who have devoted much attention to coal gas. He endeavoured to learn the nature and proportions of the more important hydrocarbon constituents of Paris gas; but after securing some interesting and suggestive results, he abandoned his line of research—apparently deterred by the difficulties he encountered. His results, viewed in the light of more recent work, appear to show that the constitution of coal gas has changed somewhat in the course of a score of years, perhaps owing to altered carbonizing conditions. The ordinary methods of gas analysis, by which a small confined volume of gas is treated with different absorbents, &c., are of little use when more than an approximation to the composition of the gas is aimed at; for thereby the hydrocarbons are, at the most, differentiated into two or three groups. When minor constituents are to be estimated individually, a more hopeful method of procedure is to pass a large measured volume of the gas through apparatus prepared for the abstraction of the particular constituent, either alone or in company with allied bodies from which it can be subsequently separated. Berthelot adopted this method in certain of his researches. He passed a quantity of Paris gas through concentrated sulphuric acid, and examined the products condensed from the gas by the acid. He obtained about 110 grains of condensation products per 1000 cubic feet of gas. Working on these products, he concluded that they consisted almost entirely of six bodies of the aromatic class, which might have been formed by condensation of the molecules of hydrocarbons of the acetylene group. From the constitution of the aromatic substances, he inferred that the coal gas contained allylene or methyl-acetylene, di-methyl-acetylene, and propyl-acetylene. It would also appear from Berthelot's deductions that the chief part of the hydrocarbons acted upon by strong (not fuming) sulphuric acid were substituted acetylenes. Even at the time of their promulgation, Berthelot's views did not pass quite unchallenged; but neither he nor other observers seem to have pursued any urther than we have indicated above, the line of research on which his inferences had been drawn.

The subject has recently been again taken up by Herr P. Fritzsche, who has communicated the results he has so far achieved to the "Journal für Praktische Chemie." He is unable to confirm Berthelot's views on the nature of the products of the action of sulphuric acid on coal gas. He expresses doubts whether the condensation of substituted acetylenes takes place at all, and shows that it certainly cannot occur to any considerable extent. It thus appears doubtful if the substituted acetylenes do exist in recognizable quantities in coal gas. Fritzsche made the experiment of treating the gas with a solution of cuprous chloride in ammonia, which completely absorbs acetylene and substituted acetylenes, before submitting it to the action of sulphuric acid. He found a scarcely appreciable diminution in the amount of the products of the sulphuric acid treatment; and he therefore concluded that the bulk of these products could not be derived from acetylenes, as Berthelot had supposed. Furthermore, he obtained a much larger amount of the products from a given volume of gas than did Berthelot. He found that a large number of different samples of gas from gas-works and coke-ovens yielded from 218 to 655 grains of the condensation product per 1000 cubic feet.

This product of the action of sulphuric acid on coal gas, consists of bodies varying in consistency from limpid oils to solids resembling rosin. The latter substances appear to be the more readily formed, as they are produced when the gas is washed with sulphuric acid of 62° to 64° Bé (81·7 to 86·5 per cent. real acid), and may thus be collected in a wash-bottle charged with such acid; while the more liquid products are collected later in wash-bottles charged with acid of 66° Bé (100 per cent. real acid). The liquid products separate as a distinct layer when the latter acid is diluted with water; and a portion dissolves and imparts a green colour to the water. If the residual oil is washed with a solution of caustic potash and dehydrated, it may be distilled; and the bulk of it passes over in a continuous flow from 212° to 572° Fahr. In order to obtain several pounds of this oil for the purposes of his researches, Fritzsche removed the benzol and sulphuretted hydrogen from coke-oven gas, and then treated it under an additional pressure of 4 atmospheres with concentrated sulphuric acid. His product was contaminated with iron, owing to a cast-iron vessel having been used to contain the acid during this treatment. The thick brown oily product deposited crystals on cooling; and they proved to be the iron salt of an acid which was subsequently isolated from the oil from which they were removed. This oil showed an acid reaction, and was washed with a slight excess of solution of caustic soda. The residual oil was then decanted off.

The caustic soda solution used was concentrated; and during the process several evil-smelling bodies separated. But the concentrated solution thickened on cooling to a deep brown pulp, in which white scales of silky lustre were visible. This white salt was separated by repeated extraction and crystallization. It proved to be the sodium salt of an acid; and from it were prepared salts of the other alkalies, of the alkaline earths, of copper, and of iron. These salts were examined by Fritzsche; and their chief properties are fully described in his paper. By passing sulphuretted hydrogen through the water in which the copper salt was suspended, and filtering, he obtained a solution of the acid from which he prepared the latter by evaporation. The acid, which appears to have the formula $C_{15}H_{26}SO_4$, is crystalline, readily soluble in cold, and very soluble in hot water. It exhibits great stability, as it is not attacked by hot concentrated sulphuric acid, and will liberate hydrochloric acid from a hot solution of common salt. It is probably the sulphonic acid of a body having the formula $C_{15}H_{26}O$, and therefore identical or isomeric with cedar-camphor. The sulphonic acids of the camphors, like the newly discovered acid, are split up with great difficulty; and thus the new body closely resembles the camphors in its behaviour.

This is by no means the only newly found body either existing in, or formed by some simple condensation from, coal gas. The alkaline solution from which the sodium salt described was obtained contained other similar acids, of which the salts appear more soluble than those of the isolated acid. The oil which remained after the caustic soda treatment also appeared, on distillation, to be likely to yield new products. The heavier portion of this oil resembled the heavy mineral oils; and a rosin-like residue remained from the distillation. The results already achieved by Herr Fritzsche clearly indicate that coal gas contains several hitherto undiscovered bodies; and further investigation on the lines he has followed should considerably extend our knowledge of the hydrocarbon constituents of gas, and incidentally throw light on the causes of the luminosity of its flame. There remains always the possibility that the research may unveil some new product of commercial value; and therefore Herr Fritzsche's further investigations will be awaited with interest.

OBITUARY.

Mr. SAMUEL GRIFFIN, who had been for several years a Director of the Salisbury Gas Company, died suddenly yesterday week, aged 61.

The death is announced, at the age of 84, of Mr. EDWIN ANSCOMBE, of Pelham House, Hurstpierpoint. Deceased for 37 years held the position of Secretary to the Gas Company.

PERSONAL.

At the recent election of members of the Thames Conservancy, Mr. F. TENDRON, the Chairman of the Grand Junction Water-Works Company, was chosen to represent the London Water Companies.

Mr. JOHN G. TOOMS, late foreman at the Keighley Corporation Gas-Works, has been appointed Manager of the Ennis (Co. Clare) Gas-Works; replacing Mr. J. A. CARTER, who goes to the Castlebar Gas-Works.

Mr. A. R. CAWLEY, of Pentre, has been successful in obtaining the appointment of Manager and Secretary of the Llanelly Gas Company, recently advertised in the "JOURNAL." There were upwards of sixty applicants.

The Teignmouth District Council last Tuesday decided, by the casting vote of the Chairman (Mr. F. Slocombe), to appoint Mr. C. JONES, the Surveyor, Manager of the gas-works until such time as these are enlarged. An amendment was moved in favour of the appointment of a professional gas manager.

At the meeting of the Guildford Town Council last Tuesday, Mr. C. H. ADAMS, the Manager of the water-works, tendered his resignation; and his services were thereupon dispensed with. The management of the Water Department has been temporarily placed in the hands of the Borough Surveyor; and it is believed that this arrangement will be made permanent.

At the last meeting of the Manchester District Institution of Gas Engineers, sympathetic reference was made to the very serious illness which had prevented Mr. W. CARR from attending to his accustomed duties at Stalybridge. His professional colleagues will doubtless be pleased to learn that he is now able to resume them; and at their meeting last Tuesday, the Gas Committee expressed their gratification at his welcome return. Though he is again at his post, he is by no means strong; but his many friends are hopeful that he may be speedily restored to his usual health and vigour. This hope we cordially share.

The officials and workmen of the Potteries station of the British Gaslight Company, Limited, met at the Etruria Gas-Works last Friday week, to bid adieu to their late Manager and his wife, Mr. and Mrs. JOHN YOUNG, and also to ask their acceptance of a handsome solid silver tea service. Mr. J. R. Heath, the new Manager, in calling on Mr. Watson to make the presentation, referred to the many kindnesses all of them had received at the hands of Mr. Young. He expressed the deep regret they all felt at parting with him, and assured him they wished him the greatest success in his new undertaking. Mr. Watson, of the Tunstall works, then made the presentation; being supported by Mr. Lovatt, of the town offices, and also by Mr. W. Nadin, who referred to the kindly feeling that had always existed between the workmen and Mr. Young. Mr. Young, in responding, thanked his friends most heartily for their kind wishes and presentation. He took the opportunity of thanking the men one and all for their co-operation in the successful carrying on of the undertaking. During the time he had been Manager, he had always assured them that the strongest union they could have was that between master and man; and as a proof of this he stated that all were receiving higher wages than when he was first appointed, and that no workman had ever been turned adrift when past the age for work. He hoped this policy might long continue, and wished them and their new manager long life and every success.

NOTES.

The Lowest Temperature of Self-Luminescence.

Herr Lummer has contributed to "Wiedemann's Annalen" some further observations on the phenomena of red and grey incandescence. It has been established that the first appearance of self-luminosity in substances gradually treated in the dark is not red, as ordinarily appears in the light, but grey. Draper has asserted that all bodies begin to glow in this way at the same temperature; but this has been disproved by Weber and Emden, who have shown that the first indication of a grey misty light occurs at temperatures ranging from 403° for German silver, to 423° for gold. The grey glow appears to fluctuate and flit about; but the image becomes fixed as soon as the red glow sets in. This may be explained by the constitution of the eye. It is the so-called rods of the retina that perceive the grey glow. The *fovea centralis* has no rods; and hence the light is not seen if looked at direct. The so-called cones, on the other hand, are the instruments of colour perception. They alone line the *fovea centralis;* and hence the red light is seen in its proper place. It would appear to be a logical deduction from these observations that the human eye will perceive an extremely faint light better when it is not directly looked at or sought for.

Steam-Turbines and Water-Meters.

Inquiries are occasionally met with respecting the performances of water-meters. Quite incidentally, testimony on this subject was given by Professor J. A. Ewing, in a report on the sea performances of the *Turbinia*—the first vessel to which the Parsons steam-turbine was fitted for the purpose of demonstrating the superiority of this system of developing motive power as compared with ordinary reciprocating engines. One of the main features of Professor Ewing's report is the record of the weight of steam consumed; and this involved the measurement of the feed water by meter. In some of the later trials, one of Kent's reciprocating meters was used, with a view to giving a more trustworthy measurement of the comparatively small consumption at low running speeds; and this meter was also tested by delivery from a tank. Mr. Stanley Dunkerley, now Professor of Applied Mechanics at the Royal Naval College, Greenwich, devoted a day to calibrating and testing the water-meters of the *Turbinia*, and found that the measurements of the Kent reciprocating meters and the Siemens meters closely agreed, even at the lower limit of speed. Professor Ewing speaks very highly of the steam turbine as a motor. An incidental merit of the turbine is that it needs no internal lubrication, so that the condensed water is free from grease. The steam is expanded two hundredfold. It remains a subject of some wonder that so little has been done to apply the same principle to the development of power from the burning of combustible gases.

The Painting of Ironwork.

The best American practice in painting structural ironwork is summed up by Mr. Max Tolz in a paper read before the Civil Engineers' Society of St. Paul. First, give the iron and steel, carefully cleaned from scale and rust, a coat of the best refined linseed oil, preferably mixed with 10 per cent. of lampblack. This coat is to be applied at the mills. Secondly, after erection, the work is to have one coat of real asphaltic varnish paint, made from the best asphalte, linseed oil, and gum. This coat should be laid on by a skilful hand, and be fairly thick. The second coat should not follow for less than ten days; and four weeks would be better. As a second coat, a good grade of graphite paint should be applied as thick as can be well worked with the brush. The graphite paint should be bought in the form of paste containing not less than 70 per cent. of pigment in boiled oil. The paste should be thinned down with boiled oil at the place of application; no driers of any kind being added in any circumstances. In recommending asphalte varnish paint or carbon paint for the first coat, great stress is laid upon the necessity for the work being dry at the time, otherwise the paint will not adhere. It is because, unlike linseed oil, the varnish paints will not absorb moisture that they are recommended. The true asphaltic varnish paints are compounded in the same manner as the black japans, and are made practically

like varnishes. The carbon paints consist mainly of carbon with some white lead. The objection to iron oxide paints seems to be principally that they absorb moisture.

Repairing Cracked Castings.

It is claimed that a new process for repairing cracked pump-barrels and other heavy castings *in situ* has been successfully developed by the Electric Metal Working Syndicate of London. It is an improved electric arc "blowpipe" system, in which the defect of welding by the electric arc—the carburizing of the metal by the carbon of the arc—is stated to be overcome. In this apparatus a pair of carbons are set at an angle of 90° with each other, with the effect of shooting out, at the point of junction, a long flame in the line of bisection of the angle. This flame can then be manipulated by the operator precisely as though it were a gas blowpipe, over which it has the advantage of temperature reaching that of the volatilization of carbon. Owing to the great length of the arc flame, the operator has a considerable range of working temperature by simply varying the distance between the carbons and the work. For filling defective castings, the method is claimed to be superior to anything hitherto tried; it being impossible afterwards to detect the appearance of repair. This will add a new terror to those which already environ the use of cast-iron in construction. More legitimate, however, is the success of the appliance as employed for the repair of the broken body of a Worthington pump. The mend was effected in this way in about five minutes; the fracture being such as would otherwise have necessitated a complete new pump body. In another example, a broken leg vice was repaired by brazing, and both this and the pump have since repair been in daily use for months.

Painting by Air-Blast.

Some further information is given by the "Engineering Record" as to the interesting experiment in painting structural ironwork on the large scale conducted by the New York Public Works Department in the case of the One Hundred and Fifty-Fifth Street viaduct, mentioned in a "Note" in the "JOURNAL" for the 26th of October. It was then shown that the Tilghmann sand-blast process had been used with success for cleaning off the old paint. Each nozzle of the apparatus was found competent to remove about 80 square feet of ironwork surface in an hour. It was pointed out that quick painting was essential, as the cleaned surface rusted very quickly. If the air of the blast was at all damp, a red film of oxide would appear on the work in ten minutes. It was decided to try whether air-blast painting would prove as efficient and expeditious in covering the work as the sand-blast was in stripping it. Accordingly, the Bryce pneumatic painting machine was tried. This is an apparatus in which a store of compressed air first stirs up and then blows out the paint through an adjustable nozzle. The test of the appliance was made with a heavy carbon paint that had been standing several months at the viaduct. Using this material, the apparatus covered 285 square feet in 20 minutes. The same work done by hand would have occupied one man from three to four hours. The wind was brisk at the time; but very little paint was dropped on the floor. The system showed to great advantage in attacking deeply recessed places, difficult to reach by hand. The overhead buckled plates were painted by the machine without any dropping of the paint; and all the cavities were thoroughly treated by it to their full depth.

Dines's Anemometer.

The subject of the velocity and pressure of the wind, and its measurement, was recently discussed in the "Engineer," mainly with reference to the labours in this regard of Mr. W. H. Dines. The article relates that the first systematic measurement of wind velocity was effected by Dr. Robinson, with the aid of the familiar cup anemometer. The first instrument of the kind was made in 1846, when it was supposed to be established that, for all sizes of the instrument, the ratio between the speed of the cups and that of the wind was as 1:3. Experience has demonstrated that this dictum, in the broad way in which Dr. Robinson stated it, was not true. It is known that the ratio is affected at once by the dimensions both of the cups and of the arms; and also that in the case of the large instruments, which are generally regarded as the "standard" size, and the records of which are mostly quoted in the case of gales, the velocities hitherto published need to be reduced by nearly 30 per cent. to get at the truth. The cup anemometer, moreover, as used for measuring the force of the wind, has the defect of yielding only average readings. By its constitution it is incapable of measuring the effect of the impact of gusts. An instrument specially devised to measure the force of gusts, called the pressure-plate anemometer, has been in partial use for nearly as long a period as the cup anemometer; but its indications are vitiated by several sources of error. Mr. Dines has sought to overcome the objections to these old forms of anemometer in his instrument constructed on the pressure-tube principle. This instrument consists of two parts—the vane, exposed to the wind; and the recorder, which may be placed anywhere. The two parts are connected by pipes. The wind blowing through the vane creates a partial vacuum in the connecting-pipes, which is indicated and registered by different means according to the type of the instrument. The constants of the apparatus were originally very carefully determined by Mr. Dines upon a large whirling arrangement at various speeds; and these have been confirmed by other tests.

COMMUNICATED ARTICLES.

MR. D. COATS NIVEN ON GAS DISTRIBUTION.

By J. SKINNER, of Crosshill, Glasgow.

Our old philosophical friend, Mr. D. Coats Niven, has been lucubrating the efforts of recent essayists on the distribution of aëriform fluids, though certainly not lubricating the journals of controversy. As the result of these midnight studies, he sallies forth in the morning feeling fully equipped to do battle with anyone daring enough to cross his double-edged logical and algebraical claymore.

In his first bout, he attacks—

$$Q^2 = \frac{D^5 \times H}{0{\cdot}0000006sL}$$

which he cuts up into—

$$Q^2 = \frac{(1290)^2 d^5 h}{sl}$$

Because $D^5 = d^5$, $H = h$, and $1290^2 = \frac{1}{0{\cdot}0000006}$. But if $\frac{1}{0{\cdot}0000006} = 1290^2 = 1664100$; then $1666666{\cdot}\dot{6} = 1664100$, which is absurd, or false cut No. 1. Although 1664100 is not the reciprocal of 0·0000006, yet it might be considered sufficiently near for all practical purposes, as the constant 1350 is found to be too large, particularly in the case of small pipes. Now, equation No. 2 may be written—

$$Q^2 = \frac{1290^2 d^4 \times d \times h}{sl}$$

and by extracting its square root it becomes—

$$Q = 1290 d^2 \sqrt{\frac{dh}{sl}}$$

which is simply Dr. Pole's formula with a smaller constant.

With this equation, omitting the factors h and s (strange omission), Mr. Niven proceeds to determine the discharge capacity of a 4-inch pipe, and says—

$$Q = \frac{1290 \times 4^2 (d^2) \times 2 \sqrt{d}}{30 \sqrt{l}};$$

and that—

$$Q = \frac{1290 \times 16 \times 2}{30}$$

that is—

$$\frac{d^2 \times \sqrt{d}}{\sqrt{2}} = 0$$

which is erroneous.

But what, in addition to the defective algebra, appears "passing strange" is the losing sight of the factor of pressure, which no successful gas distributor can ever lose sight of, whether at the beginning, middle, or end of his pipes. To determine this, either on the streets or in the consumer's premises, as near as possible to the point of ignition, there is nothing to beat the U-tube pressure-gauge, either for simplicity or effectiveness, when carefully handled and intelligently read. The writer has ended many a dispute, even where large sums were involved, by its simple application accompanied by a short explanation. And so, I opine, have many more.

Mr. Niven says it is well known (?) that the relative capacity of pipes for supplying gas is $\sqrt{d^5} : \sqrt{d^5}$—the lengths being equal. But why $\sqrt{d^5}$ and not d^2 simply? Because the volume is governed by rubbing surface as well as area of pipe.

Let V denote velocity
" f " friction of surface
" Q " quantity in cubic feet.

The fundamental relations of friction are—

$f \propto V^2$
$f \propto$ total rubbing surface
$f \propto$ specific gravity.

From the first $f \propto V^2$ comes $V \propto \sqrt{f}$. But $f \propto$ circumference into length. Therefore—

$$V \propto \sqrt{(\pi d \times l)}$$

Surfaces of cylinders of equal length vary as d. Therefore—

$$V \propto \sqrt{d}$$

Again, $Q \propto$ area $\times$ V—*i.e.*, $Q \propto \pi d^2 \times \sqrt{d}$. Therefore—

$$\frac{Q}{Q_1} = \frac{d^2 \times \sqrt{d}}{d_1^2 \times \sqrt{d_1}} \text{ Q.E.D.}$$

While $d^2 \times \sqrt{d}$ or $\sqrt{d}$ is the correct form, it would be well if even the simpler, though less accurate, d^2 were more used to guide responsible parties, as in most cases of internal fittings no rule seems to be used at all. A recent instance came under the observation of the writer, where three suburban villas nearly alike in size (eight to ten apartments each), had for distributing gas ¾-inch, 1-inch, and 1¼-inch pipes. The relative capacity of these pipes by the simple rule of d^2 would be 9, 16, 25; while by $d^2 \times \sqrt{d}$ it would be 1, 2·05, 3·58 (nearly). It should be remembered that this latter rule applies only to pipes horizontal and perfectly straight, which is not the case when they are *in situ*, bent this way and that, with their cross sections at the bends more elliptical than circular, and other causes of obstruction. Thus d^2 will be found to be a safer practical rule

for internal fittings, which seldom exceed 2 inches, and to stand the all-important pressure test better than $d^2 \times \sqrt{d}$. At any rate, it has the great advantage of being simple, and erring on the safe side.

Another of Mr. Niven's mysteries is the derivation of $\sqrt{d} \times d^2$ from $d\,2\frac{1}{2}$. I presume he means the $2\frac{1}{2}$ to denote an index of a power of d, and not a coefficient. So—

$$\sqrt{d^5} = d^{\frac{5}{2}} = d^{\frac{1+4}{2}} = d^{\frac{1}{2}} \times d^2$$

$$\therefore \sqrt{d^5} = \sqrt{d} \times d^2$$

It may not be amiss to see how this $\sqrt{d^5}$ can be derived directly from Dr. Pole's formula. Let us suppose Q to be one quantity and Q^1 another, each signifying cubic feet per hour due to difference of d only. Then we have—

$$\frac{Q_1}{Q} = \frac{1350 d^2 \sqrt{\frac{hd_1}{sl}}}{1350 d^2 \sqrt{\frac{hd}{sl}}}$$

By squaring, cancelling, dividing, &c., we get—

$$\frac{Q_1^2}{Q^2} = \frac{d_1^4}{d^4} \times \frac{d_1}{d} = \frac{d_1^5}{d^5};$$

$$\therefore Q_1 = \frac{\sqrt{d_1^5}}{\sqrt{d^5}} \text{ or } Q\frac{d_1^{\frac{5}{2}}}{d^{\frac{5}{2}}}$$

And by the aid of logarithms we have—

$$\log. Q_1 = \log. Q + \tfrac{5}{2} \log. d_1 - \tfrac{5}{2} \log. d.$$

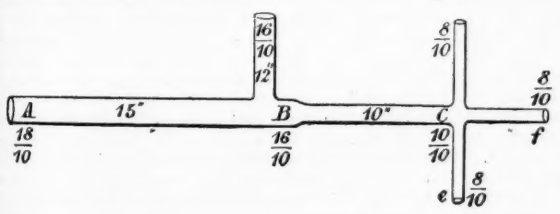
$$\therefore \log. Q_1 = \log. Q + \frac{5\,(\log. d_1 - \log. d)}{2}$$

When logarithms are used, there can be no controversy as to $\sqrt{d^5}$ or $(d^2 \times \sqrt{d})$ being the simpler, because $\log. \sqrt{d^5} = \log. (d^2 \times \sqrt{d})$; that is, $\frac{5}{2} \log. d = 2 \log. d + \frac{1}{2} \log. d = 2\frac{1}{2} \log. d$. Similarly, other relations can easily be obtained, such as—

$$Q_1 = Q\,\frac{\sqrt{l}}{\sqrt{l_1}}$$

In these relative results the pressure is supposed to remain constant, and, if not known, the results are perfectly worthless for practical purposes.

As a further illustration of the value of the ordinary gas pressure-gauge in its threefold capacity as a test for stoppages, leaks, and difference of pressure between given points, consider the following diagram of mains:—



Let us suppose A B to be a 15-inch, d a 12-inch, and B C a 10-inch main. With such a diagram of diameters and pressures, one has no difficulty in determining what he has to do first—viz., carry forward the 15-inch main to C. The effect of this may be to raise the parts of the district e, f, g 4-10ths or 5-10ths, and at the same time lower the pressure at B, probably to such an extent as may necessitate the enlargement of the main between A and B. This point, however, can be ascertained only by re-testing the district when the demand is greatest, after the first part of the operations has been completed. If the problem were simply this: "A pipe of diameter d and length L, between the points B C, shows a difference of pressure h; what quantity Q can be passing the point C?" one might solve the riddle while sitting cosily by the fire. But such is not actually the case. What gas is being consumed beyond the point C may be problematically solved by the aid of experience, but certainly cannot be definitely determined. In other words, we know Q, or we can know it with the existing data, but not the variable function x, which can only be discovered by perhaps repeated trials. Of course, with respect to the individual consumer, x may be nearly guessed, and added to Q; giving the required quantity as $Q + x$. But even here a large margin must be allowed.

The foregoing obviously shows the problem of distribution—especially that kind of distribution which aims at the equalization of good working pressures of (say) not less than 15-10ths before the gas enters the consumer's premises—to be not easy of solution. It may be fearlessly asserted that such problems cannot be solved with mutilated algebraical formulæ, not even when all the factors are before one's eye, unless they are largely tempered with great experience and good judgment; so that no "old stager" is likely to "give himself away" on a short and easy rule or method, or some process of clairvoyance. Suppose we try to examine syllogistically some of Mr. Niven's statements. He asserts that all gas managers, even the most ignorant, know and use the symbol $\sqrt{d^5}$. The essayist says that in some quarters it is not. Therefore some men who are not gas managers do not know how to use $\sqrt{d^5}$. Query: Why find fault with one who supplies you with your minor premiss? Again, we are told that the simplicity of the old rule $d^2 \times \sqrt{d}$ is the reason why it, and no other, is applied. Yet in such matters every man has his own short and easy method, and even Mr. Niven has his own easy rule, for solving such easy problems while you wait.

After all, then, there seem to be several rules; and one would like to know them. Hence we have: Every gas manager works distribution problem on his own easy rule. But there is only one right rule. Therefore several gas managers (Mr. Niven included) work on simple, but wrong, rules. Or again: All experienced men assert that they cannot properly and expeditiously detect escapes in gas-pipes *in situ* unless they use an odorous and flammable gas. Some men, including those who recommend apparatus for the purpose, believe that air which is neither odorous nor flammable may be so used. Therefore some men (including Mr. Niven) are not experienced detectors of gas escapes. Or it may be put thus: All A is B; but some C is not B; therefore some C is not A.

I suppose, when Mr. Niven speaks of natural ability, he must mean his readers to understand ratiocinative or argumentative ability. But what useful purpose can this serve apart from keen observation and large experience, or the knowledge of intuition and induction? What can be meant by natural routine? Surely not the routine of Nature—the sequence of natural law. But, if not, what then? one might ask. What possible resemblance can there be between an experienced logician who purposely acquires his skill in logic to enable him to arrive at the truth of things by a sort of short cut, and an expert boxer who learns his art for the purpose of knocking the next man down, or, it may be, punching his neighbour's head. This error of attempting to connect things unlike is called, I think, in logical parlance, *fallacia compositionis*. We have yet another case of seductive deduction. Most gas men at home, where many are ready to help, do not need much logical skill; but most gas men abroad, where few are ready to help, need much deductive skill. Therefore gas men abroad are greater logicians than their colleagues at home. This is clearly what Mr. Niven implies in his latest effusion. But he must take his non-logical brethren at home to be a credulous lot if he fancies they will gulp down such a glaring case of *petitio principia*, or begging of the question. Had he said that men abroad, much more than men at home, need to be resourceful and adaptive, like the country tradesman as compared with his city compeer, one could have given credence to his hasty induction.

Now, what on earth has scholastic logic to do with the solution of such common difficulties as the following? For example: A large main breaks, and no bladder, valve, or main of similar size is at hand. What then? Or a large dry meter suddenly becomes bound, or the drum-shaft of a large wet one suddenly gives way at its bearings, depriving a big establishment of gas. Not having duplicates to put in their place, what is to be done? Or a large main is being repaired, and the thimble cracks when it is being set up, and no other is at hand. What is the remedy? Or a main is to be extended a few lengths with a smaller size, and there is no reducing-piece near. How is the work to be done? Or, again, a subsiding main unexpectedly makes its defect known by threatening to stop the supply beyond, owing to flooding. And so on, *ad infinitum*.

Mr. Niven asks his readers not to think him churlish. Well, no; we are not likely to do that. But may we not characterize his latest mental bye-product as illogical and egotistical?

THE WORK OF THE HYDRAULIC MAIN AND CONDENSER.

By S. Carpenter, of East Ham.

I know that, in connection with what I am about to say on the work of the hydraulic main, objection may be raised by some to a wet main. But I shall not hold any controversy respecting the difference between the wet and the dry main. I am simply going to explain the working of the wet main, and what I found to be the best in my practical experience with it.

In the first place, the hydraulic main should not be less than 12 inches square in small works, and 18 or 20 inches square in large ones. As the gas issues from the dip-pipes, it should have plenty of room to develop. Cramping the gas in the main interferes with its flow from the retorts. The main should be made of wrought iron, which is best on account of its freedom from breakage. There should be side plates, so that they can be taken off when cleaning out is required. The hydraulic main is a very peculiar apparatus to fit up so that it may work satisfactorily; and the writer hopes the hints here given, as the result of many years' experience, may be of service to young gas managers, as a preventive is in all cases better than a cure.

We will begin with a main 18 inches square and 20 feet long. This will take two beds of retorts set eight in a bed, 20 inches by 14 inches. The ascension and dip pipes should be 8 inches in diameter in the centre of the main; and at the side there should be fixed a seal-regulating valve. There should also be a hole, the bottom of which should be ½ inch higher than the bottom of the dip-pipes. There would then always be ½-inch seal. At the back of the main there should be a pipe connected to the seal-valve, to take away the tar and gas. The valve can be regulated to whatever height of seal is required on the dip-pipes. The

gas and the surplus tar will pass over the seal into the pipe at the back; and they should flow on together to the inlet of the condensers.

In practical experience, the writer has found the wet main to be the best, in several ways. In the first place, it acts as a water-valve, and prevents the gas from returning down the ascension-pipes when the retorts are open. Secondly, by having 1½ inches of tar for the seal of the dip-pipes, the gas has to pass through the tar-seal. To a certain extent tar is a purifying agent. At the same time, if its—the hydrocarbons or similarly constituted substances—ingredients did not combine and adhere, the perfect purification of coal gas would be almost an impossibility. When the gas is bubbling through the tar, it loses its smoky colour; besides which there are sulphuretted hydrogen and bisulphide of carbon, and many other impurities—too many to mention here—contained in the combination of hydrocarbon compounds called tar. So that the hydraulic main acts as a water-valve, a condenser, and a purifier. Hence we see the necessity for not separating gas and tar before the condensers are reached; for there they will separate of themselves.

It will be said that there is an accumulation of thick tar deposited at the bottom of the main. So there is; but this difficulty can be easily overcome by fitting up the main in the following manner: It should be 18 or 20 inches square, and made of wrought iron. The dip-pipes should project through the top 12 inches, and in 20-inch mains there would be a clear 8 inches between the bottom of the main and the ends of the dip-pipes. It may be convenient to describe here an apparatus for keeping the main clear of thick tar or other sediment while it is in action; thus obviating the necessity for stopping gas making, opening the main, and drawing off the tar, as is usually done. The appliance consists of a screw shaft running the entire length of the main, through a stuffing-box attached to the outside at one end of the main and to the inside at the other, and supported, where necessary and convenient, by intermediate bearings on the inside of the main. Upon the shaft work a number of shaped plates, called scrapers, each having a threaded hole into which the worm of the shaft works. On the shaft revolving, the scrapers will travel forward or backward in the direction of its length, whichever way the shaft is turned. The scrapers are of such a depth that there is considerable clearance between them and the bottom of the dip-pipes. The shaft is placed at one side in the interior of the main; and the holes in the scrapers are at one end of them, not in the centre, so that the shaft shall not turn directly under the bottom of the dip-pipes. On the outside of the main at either end, or at the one most convenient, the shaft is furnished with a crank-handle, by means of which it may be caused to revolve in any desired direction. The scrapers extend right across the main transversely, and travel on sliding bars fixed longitudinally on each side at the bottom of the main. They do not quite touch the bottom plate, but allow just a slight clearance, to prevent friction. At intervals there are attached mud-boxes, into which the main opens; and the thick tar or other sediment is caused to fall into them by the scraper passing along and drawing it to the openings. The mud-boxes are continued from below the main up the side to the same level at the top, but are distinct from the main, so that the tar or other liquid is at the same level as that in the boxes. The tops of the boxes are covered with plates which can be removed, and the thick sediment can thus be taken out at any time by scoops while gas is being made, without interfering with the seal of the dip-pipes.

If the hydraulic main is fitted up in the manner described, there will not be any accumulation of thick tar or other sediment therein, and the number of stopped pipes will be greatly reduced—in fact, it will be almost a perfect main. If, however, it is not practical to employ the screw shaft, there is another way of keeping the main clear, which I will now describe. Cut a slot in the side of the main 18 inches long and about 4 inches deep; and let the bottom be 1 inch above the bottom of the dip-pipes. Have a moveable plate on the slot-hole, so that it can be taken off whenever required for cleaning out the main. In the centre of the main, at the bottom, there should be attached a mud-box or pocket, fixed in open connection with the bottom of the main, and carried above the level of the tar therein, so that the tar inside and outside the main will be at the same level. The plates of the box can be easily removed without interfering with the seal of the tar in the main, and the box cleaned out when required—about once a month.

Before clearing the main, the seal-valve should be shut, and the plate on the side of the main taken off. A scraper attached to a long handle should be put into the hole; and then by drawing this forwards and backwards between the ends of the dip-pipes and the bottom of the main, the thick tar or other sediment will be pushed into the mud-box, whence it can be removed without interfering with the seal of the tar. By cleaning out the main in this way, the number of stopped ascension-pipes will be reduced very much, and, of course, the make of gas per ton of coals carbonized will thereby be increased. With regard to stopped pipes, the writer tried for many years to find the cause of this trouble; and at last he discovered that the principal one was in the hydraulic main. He found that keeping the main clear of thick tar and sediment helped greatly to reduce the number of stoppages.

It will now be convenient to consider the work of the condenser—one of the most essential of the appliances used in gas manufacture; for it does more than condense the gas, it also serves to reduce its temperature to the degree most favourable for depositing its ammonia in the scrubber. In the writer's opinion, the tar in the condenser eliminates a portion of the sulphuretted hydrogen and bisulphide of carbon, as these impurities are found in the tar. The condenser may, without question, be regarded as part of the purifying plant. When the gas leaves the condenser, it has lost the smoky colour by which we know that the apparatus has commenced the purifying process. The writer's experience with condensers is this: An apparatus consisting of a double row of pipes about 18 feet high; the size of the pipes being in accordance with the make of gas per hour. These pipes stand vertically on a cast-iron box, having end plates bolted to flanges at either end, so that they can be taken off and the condenser cleaned out. The upper ends of the stand-pipes are connected to a box running the whole length of the vertical pipes. The upper box is partitioned off in opposition to the partition-plates in the one at the bottom. This is the simplest and one of the best forms of apparatus for the slow condensation of gas. The gas coming from the outlet of the hydraulic main is, of course, conveyed to the condenser. Great care ought to be taken in cooling the gas before it enters this apparatus. Do not cool it too suddenly; and do not take the gas from the retort-house into the atmospheric air. If possible, take it just under the surface of the retort-house before it enters the condenser. Excessive condensation has its disadvantages; while insufficient condensation has also its evils. If the gas is gradually cooled, the writer is strongly of opinion that there will be little or no naphthalene either before the gas is purified or after it has undergone the process of purification.

The writer prefers the vertical condenser for several reasons. By its use the gas can be cooled very gradually, and the temperature can be taken at several places; while by passing the gas up and down the pipes, the particles of falling tar come in contact with the stream of gas, and take up some of its impurities. The condenser, therefore, as already remarked, to a certain extent acts as a purifier. In the vertical condenser, the gas ascends one series of pipes and descends the other—the tar and ammoniacal liquor passing off at the bottom box. Connected to this box there should be a self-acting syphon to take off the tar and liquor to the tar-well; and at the inlet of the condenser there should be another to carry away as much of the tar and liquor as possible into the well before the gas passes into the condenser.

After the gas leaves the condenser, it goes on to the exhauster. On its way, there should, if possible, be two syphons. From the outlet of the condenser to the first syphon, the main should drop 2 inches in 12 feet; and from the outlet of the syphon it should rise in the same degree until it reaches about half the distance between the two syphons, and then it should drop 2 inches in 12 feet until it comes to the second syphon, when it should rise to the inlet of the exhauster. In this way the tar will be drained off before the gas passes into the exhauster. If the hydraulic main and the condenser are worked in the way described, the gas will be well prepared for the scrubber. The object of the condenser is not only to cool the gas, but to reduce into ammoniacal liquor and tar the vapours intermixed with it as it issues from the hydraulic main, by which process the tar is, to a certain extent, prevented from passing forward to the other apparatus.

Before proceeding further, it may be well to briefly notice the impurities met with in the crude gas as it leaves the condenser. These impurities are: Ammonia (NH_3), carbonic acid (CO_2), sulphuretted hydrogen (H_2S), and bisulphide of carbon (CS_2); and they cannot be avoided. Carbonic acid is always generated in the process of manufacturing coal gas simply because every description of coal contains oxygen; the sulphur and hydrogen which the coal contains combine and form sulphuretted hydrogen, part of the carbon combined with the sulphur to form bisulphide of carbon, and the nitrogen unites with the hydrogen to form ammonia. It is absolutely necessary to remove these impurities as they are not only useless but injurious if left in gas intended for illumination. This matter must, however, be left for another article.

Herr F. Lux on "Water-Meters."—We have received a *brochure* on Water-Meters, entitled "Zur Wassermesserfrage," by Herr F. Lux, of Ludwigshafen-on-the-Rhine. It is of a polemical nature, and deals with claims put forward by Herr Rosenkranz, in the "Journal für Gasbeleuchtung," to priority in the use of an unbroken stream of water, and of vulcanite and Delta metal in the construction of water-meters. With regard to the unbroken stream of water through the meter, illustrations are given of twelve meters embodying this principle, and patented in England prior to 1872, the year of Rosenkranz's first use of it. He protected in 1880 a meter in which a vulcanite fan was used; but Herr Lux cites seven instances of the earlier use of this or similar light material. The Schinzel and Lux meter was stated by Rosenkranz not to differ in any essential particular from the earlier meter of Tylor; but Herr Lux points out several distinct differences. The use of vulcanite and Delta metal for water-meters, which is a chief item in the controversy on priority of invention between Herren Rosenkranz and Lux, was described by the latter in the early part of this year, in a paper abstracted in the "JOURNAL" for March 23 (p. 654).

TECHNICAL RECORD.

AMERICAN GASLIGHT ASSOCIATION.

The Annual Meeting at Fort Monroe.

(*Concluded from p.* 1177.)

Mr. T. Littlehales produced a table showing results of tests of 5427 consumers' meters, as carried out at Syracuse (N.Y.) in pursuance of a plan for testing the whole of the meters in the district. The extreme range of error was from 18 per cent. fast to 32 per cent. slow; but only 31 meters were more than 7 per cent. fast, and only 61 were over 12 per cent. slow. The totals showed 1744 fast, 3035 slow, 616 correct within 1 per cent., and 32 stopped registering. The average over the whole was 1·44 per cent. slow, or in favour of consumers. He remarked that, in the course of 30 years' previous experience, he had scarcely known a meter to go over 8 per cent. fast. He had therefore made a special examination of the 31 above named, and found that the diaphragms were too thin; the upper part doubling into the chamber instead of outwards. This defect had, he believed, been already remedied; but several of the thin diaphragms might still be in use. His figures showed that errors of registration were not a very important factor in regard to unaccounted for gas.

In the course of the discussion, Mr. Thompson suggested that the author should add a supplementary table reducing the loss to percentage in terms of 1-light meters. The size of the meter would have a great effect on the percentage of gas lost. A 5-light meter, for example, might be 5 per cent. slow, and so might a 100-light one; but the quantity of gas not paid for would be much greater in the latter case. Mr. Jenkins added that the size was only an approximate indication of the consumption; and the only way of getting at the actual loss was to figure on the quantity of gas that had passed the meter.

Mr. A. S. Miller, of Long Island (N.Y.), submitted the result of some further experiments on interior illumination, which he had undertaken at the request of the Research Committee. Referring to the experiments made by Mr. Page, as reported at the last meeting, he said that the use of several reflecting surfaces was a source of error; and therefore he employed a disc instead of a box. A 60-inch and a 72-inch photometer bar were arranged in parallel, 12 inches apart; and the longer bar was used for comparing the reflected light, while the shorter one served for direct comparisons. The object in view was that the reflecting screens might be as nearly normal to the line of the bar as possible; and they were placed normal to a line bisecting the angle between the 72-inch bar and the line drawn from the centre of the light to the centre of the screen. When a flat-flame burner was used, it was so placed as to bisect the angle between the photometer disc and the reflecting screen. The reflecting screens were 12 inches diameter, easily interchangeable, and capable of being rotated round a vertical axis; and as far as possible the tests were made on lights of equal illuminating power. Mr. Page's experiments seemed to show that a slight variation in the colour of the light made a great difference in the amount absorbed by the screen; and also that very much less of the light which had actually passed through an opal globe than that which came through the openings at the top and bottom, appeared to be absorbed. Attention was directed to the further elucidation of these points. The method followed was to compare the lights directly, and afterwards the reflections. An opal globe was next placed over one light, and the experiments repeated. The globe was then transferred to the other light, and the comparisons made as before. Every possible precaution in the way of ensuring accuracy—such as reversing the screens, partially rotating the opal globe between each reading, &c.—was observed; but it was obvious the small percentages of reflected light dealt with, and the differences of colour, rendered it difficult to read closely. Four kinds of paper were used on the screens; No. 4 being a sample of that used by Mr. Page. A Welsbach burner, tested against a No. 7 slit union, gave 1·4 by direct light, and 1·3 by reflection from paper No. 1. The test repeated, with the union jet turned partly off, gave 2·8 direct and 2·45 reflected. With the globe over the Welsbach, the union jet was the brighter, in the proportion of 1·4 direct and 1·55 by reflected light. Operating with paper No. 2, the Welsbach was 2·1, as compared with the No. 7 union jet by direct, and 1·85 by reflected light; and the effect of using the globe was to slightly diminish the ratio between the direct and reflected light. The No. 7 union was compared with a No. 3 union; the consumption being adjusted to give as nearly as possible equal lights. With the naked lights, the reflected light was 93 per cent. of the direct; but when the globe was used, the direct and reflected light was about equal. Using No. 3 paper, the results were very similar for the flat flames, except when the globe was over the No. 7; and then the reflected light was only 91·4 per cent. of the direct. The Welsbach tested against the No. 7 gave results similar to those with paper No. 1. Paper No. 4, while rather unfavourable to the naked Welsbach, was well suited to the opal globe; the reflected light being actually greater than the direct. The loss of light due to the use of the opal globe was observed to range between 68 and 75 per cent., and was higher with Welsbach than with flat-flame burners.

Discussion being invited, Mr. Page said he was glad to find that the author agreed with the point he had endeavoured to illustrate last year—viz., that illuminating effects were not necessarily measured by the photometer. He hoped that in the experiments quoted, the angle at which the reflecting screen was placed had been accurately determined, as a very slight variation would exercise a marked effect on the results. It was partly for this reason that he abandoned the single surface in favour of the box; but the chief object in so doing was to approximate as closely as possible to the conditions actually existing in an apartment. The paper should have been entitled "Some Experiments on Surface Reflection," as there were no conditions approximating to those of an interior. Having pointed out some discrepancies in the results, he said that last year he endeavoured to show that illuminating effect was largely influenced by the colour and other characteristics of the source of light. The author had substantiated his results, especially by showing that the reflecting power of a flabby half-size flame was greater than that of a stiff flame. Mr. A. C. Humphreys denied having asserted that illuminating effect could be measured by the bar photometer; but he did maintain that the instrument was the best at command for estimating lighting values.

A paper on "Leakage" was contributed by Mr. J. M. Rusby, of Jersey City (N.Y.), who had had some experience in testing mains; using a test meter, and isolating successive sections as required. For stopping the main, he employed two rubber bags, and kept the intervening space charged with water. If the inside of the main was so rough that difficulty was found in getting a tight joint, a gruel of oatmeal could be used instead of water. In the first place, a district of about half a mile in length was tested, and if leakage was found, it was located by cutting off small sections at a time at the far end. The outlay on a systematic test throughout the district on this plan was only a fraction of the cost of valves. For getting close to serious leaks, he used a tapered bar with a square head, on which a tee-handle could be fitted. In close ground, such as concrete or asphalte, the bar must not only go down over the pipe, but also over the joint; and a great assistance was to permanently mark the position of two or three joints in each block on the curbstone. Services could be tested by means of a force-pump and pressure-gauge; and when doing the job, it was quite worth while to do it well—renewing all services that were found to be in bad condition. Of course, conditions varied in different places; but in his case the greater part of the leakage was found to be due to old services, many of which had been stopped off and forgotten. Exposed threads were particularly liable to corrode, and should be carefully protected by wrapping with cloth and white lead. He also kept records of the repairs and condition of services, together with diagrams of the test districts, &c. He recommended the varnishing of service-pipes, and preferred nearly all cement joints for mains; each length being tested under 8 inches pressure before being covered up. He carefully tested the station meter from time to time. With regard to the consumers' meters, the small ones were proved, and repaired if necessary, every three years; and the large ones, every year. In concluding, he referred to differences of pressure, water vapour, and temperature, as concerned in the question of unaccounted-for gas.

In the course of the discussion, Mr. A. C. Humphreys remarked that the holders, and especially the crowns, often contributed liberally to the leakage account. Mr. Jenkins had been greatly troubled by electrolysis, and exhibited specimens of perforated mains and service-pipes.

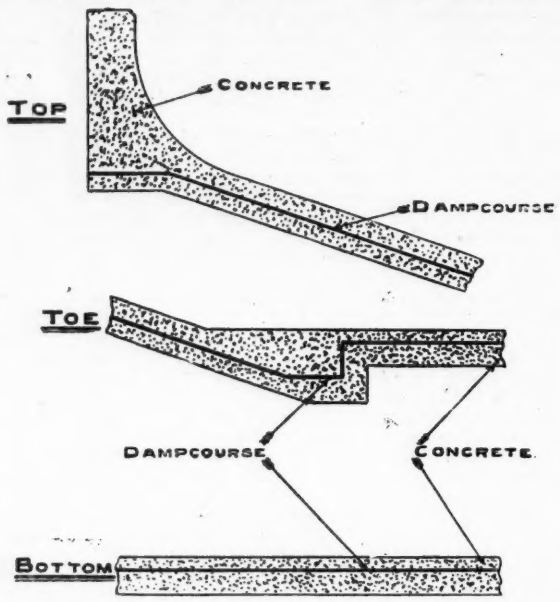
The usual series of votes of thanks were then passed, and the meeting closed.

CALLENDER'S PURE BITUMEN SHEETING.

We have recently had our attention called by Messrs. Callender and Montgomery, of Essex Street, Strand, to the pure bitumen sheeting manufactured by Callender's Cable and Construction Company, Limited, and particularly to its application in such work as the construction of reservoirs and gasholder tanks. As engineers have often been unpleasantly reminded, concrete is not, even at its best, impervious; and it is now the general practice to render the surface with a water-proofing material. For this purpose asphaltic materials are largely used; but artificial asphalte has proved to be not altogether reliable—the absence of elasticity, resulting in fracturing and fissuring, being its constant defect. This all-important quality of elasticity is possessed in a remarkable degree by the pure Trinidad bitumen of which Callender's sheeting is composed. A sample of the material affords sufficient proof that it will not crack when bent; and experience and experiments show that, not being rigid or solid as is the case with ordinary asphalte and cement, it will not split or give way when anything in the nature of a settlement takes place. Such a material cannot fail to find a wide field of usefulness. For many years it has been produced in a form suitable for damp-proof courses for buildings; and for this purpose it has been largely adopted. It is now made in several thicknesses, and in lengths of 24 feet, and of any width required up to 6 feet. In this form it may be brought into service very largely in water-works construction, and, on a smaller scale in gas-works, for

rendering holder tanks water-tight, covering flat roofs and arches, and for damp-proof courses in buildings.

The accompanying illustrations show the method of using the sheeting in reservoir construction; and in this direction some valuable experience has already been gained. The manufacturers were led to turn their attention to reservoir work by the success which attended the lining, in 1885, of a pond at Govan of over 6000 square yards in extent. The architect for the work was Mr. John Honeymoon, of Glasgow, who, after ten years' trial, wrote that there had been no complaint, and the pond was full. Mr. James Mansergh has adopted the sheeting in the construction of the new Randymere reservoir of the Whitby Water Company; and when completed about 25,000 square yards will have been used. Six months' trial at the new Burton and Swadlincote Water-Works has proved its efficiency under very trying circumstances. It has also been adopted for



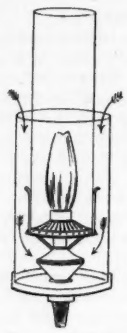
various water-works purposes at Belper, Buxton, Chester, and the Nine Elms pumping-station. At Chester its utility as a covering for water-pipes is being tested. By reason of the fact that the sheeting is sent out from the works ready for laying, a great saving of time and expense must be realized by its use—indeed we are told that, if a flat surface has to be dealt with, about 1000 square yards can be laid in a day. The sheeting requires to be laid on a more or less smooth surface, as a rough surface would damage the material by penetrating through it when pressure was applied. It is also advisable to protect it on top with a thin covering of cement. In connecting the pieces, the edges of each are overlapped by about 1½ inches; and a perfect joint is secured by means of heated irons. The many advantages to be derived from the use in structural work of a material of this kind will be readily recognized.

BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER.

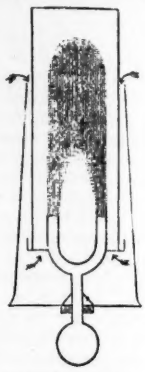
Another gas-burner of the "mantleless" type has come on the market, under the description given in the heading to this notice. But this description, it may at once be said, is somewhat misleading; and the use of the terms "non-mantle" and "incandescent," it is apparent, have been ingeniously adopted with the view of attracting the attention of the public. It is true that no mantle is employed; and no one will gainsay us when we assert that the flame is just about as incandescent as any other luminous flame of equal candle power. Beyond this there is no reason for applying the expression "incandescent" to this particular light.

The simplicity of the burner admits of a description in few words. As the accompanying illustration indicates, an argand burner is used; and below this there is what the "inventor" calls a heating chamber, containing packing and baffle-plates. This chamber is heated by the hot air which impinges on it; and consequently, in passing through the chamber, the gas becomes heated. Surrounding the flame is a chimney of ordinary dimensions; and outside this, from below the heating chamber to about half the height of the chimney, is a glass cylinder, closed at the bottom by a talc disc. The air for supporting combustion is drawn into the annular space as indicated by the arrows; and, of course, the glasses becoming very hot, the air is highly heated in its passage to the flame. During an inspection of the burner last week, the flame was described as being of the form of an "attenuated cone," with a "very small zone of blue." This is nicely expressed; but, unless our eyes deceived us, there is very little difference between the flame of this burner and that obtained with an ordinary argand.

On the gas-heating chamber is stamped "Patent 18,978." This appears to be the only part of the whole arrangement to which the "inventor" can lay claim; and any beneficial result obtained thereby could certainly be realized in some other equally simple way. Then the principle of heating the air supply to an argand burner by means of a double chimney was known as far back as the fifties; and, for interest, we give side by side with the illustration of the "patent non-mantle incandescent gas-burner" a diagram of an arrangement devised by the Rev. W. R. Bowditch in 1854, and which bears a striking resemblance to Mr. Billing's burner. In the course of a series of



BILLING'S "NON-MANTLE" GAS-BURNER.



BOWDITCH'S REGENERATIVE GAS-BURNER.

articles on "Gas-Burners Old and New," by "Owen Merriman," published in the "JOURNAL" some years since, and afterwards reprinted in book form, the following reference is made to Mr. Bowditch's burner:—

> The principle of heating the air supply to an argand burner, by means of waste heat from the flame, was partially applied, with some success, by the Rev. W. R. Bowditch, M.A., of Wakefield, in 1854. Mr. Bowditch's burner contained, in addition to the ordinary chimney, an outer glass chimney, which extended for some distance below the inner one, and was closed at the bottom; so that all the air needed to support the combustion of the gas was required to pass down the annular space between the chimneys, and in its passage became intensely heated by contact with the hot surface of the inner chimney, as well as by radiation from the flame itself. This burner contained many defects. Among others, the inner chimney could not long withstand the intense heat to which it was subjected, and, in consequence, had to be frequently renewed; the heating of the air was not effected solely by the products of combustion, but, perhaps in a greater degree, by the abstraction of heat from the flame itself; while, at best, this heating was but partial.

Mr. Billing's experience does not confirm the above allusion to the damaging of the inner chimney, as he asserts that up to the present he has not found any buckling or melting. With regard to the duty obtained from the burner, we are informed by a circular issued by Mr. Billing that, with a consumption of 5 cubic feet of gas per hour, a lighting effect is obtained at least four times greater than can be realized with an ordinary burner, and double that of the "London" argand; but no figures are given to support this. In reply to an inquiry on the point, he stated that the illuminating power of the burner was 30 candles. This being so, the ordinary burner with which the comparison was made, and which only developed a duty equal to a quarter of this with a consumption of 5 cubic feet, must have been an extraordinarily poor one. The "new" burner is only made in one size; and its price is 5s. 6d., which is slightly less than a Welsbach incandescent burner. But the small additional cost of the latter is more than compensated for in its lower consumption of gas and much higher illuminating power.

CYANIDES IN GAS MANUFACTURE.

By HERMAN POOLE, F.C.S.

[Prepared for the "American Gaslight Journal."]

One of the leading and most interesting questions now before the gas manufacturer is that of cyanogen and its compounds—the cyanides, ferrocyanides, and sulphocyanides. Not only has attention been drawn to this subject by the chemist, but also by the manufacturer and user of these chemicals. A few years ago the question of residuals was not considered worth talking about; only fanatics and hobby-riders would think of them, much less give them earnest consideration. Then coke was not regarded as a residual, because there had been a sale for it from the beginning of the gas industry, and even before such date. Gradually it became known that tar was actually worth something; then the ammoniacal liquor became valuable, and hence ceased to be a nuisance. At this stage of the history, "residuals" came to be a common word, and was soon applied to all, solid or liquid. A market having been found for the coke, ammonia, and tar, the next one to be taken up was cyanogen and its compounds; and now these have become important matters. Here it may be interesting to consider the order in which these residuals were utilized. First the coke from the retort; next

the tar from the hydraulic main and the condensers; then the ammoniacal liquor from the condensers and scrubbers; and now the sulphur and cyanides of the purifying-box. We shall soon have to put on something beyond the purifier, and make another bye-product.

The quantity of cyanides from gas now wasted in the world is simply enormous, even in spite of the modern attempts at recovery. Such waste is a disgrace to our so-called advancement in science and art. True, the proportion of nitrogen in coal is small—not often exceeding 1 per cent., and very seldom more than 2 per cent.—yet, with only one-fifth of this being converted into cyanogen, considering the millions of tons of coal used, we easily see that thousands of tons of cyanides and thousands of dollars are yearly cast away. In 1895, Germany exported a million dollars' worth of cyanide of potassium, most of it from gas sponge; and from this we can get an idea of how much we should make. Of course, as is usual with new countries, we have been slow to appreciate the enormity of the crime of throwing away valuable material. We are doing it all the time, and in nearly all industries; and so we are accustomed to it. But we are gradually changing our ideas.

In discussing this question, one of the first queries that comes up is how the cyanides are formed. This question has been asked and answered repeatedly; but, I am sorry to say, not always in the same way. The amount of actual experimental work performed to elucidate this point is very little. Occasionally someone gives a small contribution towards the solution; but no regular, systematic, continued research has ever been made. It cannot be settled by one day's experiments, nor by tentative work in the laboratory with pure materials. The gas manager cannot find the time, if he would—the ordinary chemist cannot do it, if he had the time; and so we may still expect occasional sporadic efforts, and nothing accomplished of a satisfactory nature.

Prominent among the known facts in this connection is the one that, if ammonia gas is passed slowly over incandescent carbon, more or less hydrocyanic acid and ammonium cyanide with hydrogen are produced—

$$C + NH_3 = CNH + H_2; \text{ or,}$$
$$C + 2NH_3 = CN, NH_4 + H_2$$

The slower the flow of the gas, the greater the quantity of cyanogen compounds formed. Care must be taken not to heat the resulting products too high, or partial dissociation will take place, with resolution to the elementary forms. In presence of a large excess of hydrogen, or a moderate excess with increase of temperature, the product is hydrocyanic acid alone; the ammonium salt being prevented from forming by the heat, or being decomposed if formed.

If, instead of using carbon in the solid state, gaseous carbon combined with oxygen, as in carbonic oxide, be mixed with the ammonia gas, and this mixture heated, the hydrocyanic acid or ammonium cyanide will be produced as before, according to the proportion of the gases; and usually they are found together in variable quantities—

$$CO + NH_3 = CNH + H_2O; \text{ or}$$
$$CO + 2NH_3 = CN, NH_4 + H_2O$$

Of course, this action is dependent on the quantity of surface exposed to the heat; and hence the action is more complete when the gases are passed through a heated tube filled with fragments of porcelain, earthenware, silica, or other inert refractory substance.

If to the preceding products sulphur be added, or if the ammonia gas be mixed with gaseous sulphur, as in carbon disulphide, ammonium sulphocyanide is then produced—

$$CS_2 + 2NH_3 = CNS, NH_4 + H_2S$$

This will remain permanent under conditions which would decompose the others.

While performing these experiments, and at easily attainable temperatures, three laws are shown:—

1.—The higher the temperature and the slower the flow of gas, the greater the yield.
2.—The single reactions are never complete, but always occur together and in variable proportions.
3.—If the reactions occur in the presence of sulphur, it will always enter into the combination produced.

If the reactions are carried on in the presence of a fixed alkali or alkaline earth, the proportionate yield is much greater. These seem to have the property of fixing or solidifying the cyanogen compounds as formed, and thus partially withdrawing them from further action.

It is not necessary that the ammonia should be in the state of free ammonia. Ammonia chloride, carbonate, and especially sulphide, will do as well; only in this case the secondary reactions will be more complicated.

A very neat way of trying this experiment, and one easily performed, is to cause some water gas to bubble through ammonia water, and then burn the mixture in an ordinary burner. The carbonic oxide and the ammonia will thus exist in the gas; and on burning it and causing the flame to impinge on the surface of a tumbler of weak potash solution, potassium cyanide will be produced, which can be detected in the liquor. If distilled water be employed instead of the potash solution, ammonium cyanide will be formed. If the temperature be allowed to become high enough, as with a bunsen burner, no cyanide is formed; showing that, although heat is necessary too much destroys its compounds.

Stress is laid upon these preliminary fundamental reactions, because they are now old and well established; having been proved in 1841 and accepted since. A thorough understanding or appreciation of this is necessary, as the conditions are very similar to those existing in the retort. Here may be found the incandescent carbon, the carbonic oxide, the ammonia, the carbon disulphide, and probably other elements which have an influence on the cyanogen formation. It has been shown that the reactions take place more readily in presence of coal gas than with pure substances, and that in such mixtures the formation of hydrocyanic acid takes place at a lower temperature. The quantity of free hydrogen in the crude gas has a modifying effect, since a large percentage is always accompanied by a small percentage of ammonium cyanide. Here comes up the question whether the small cyanide percentage is actually due to the presence of hydrogen *per se*, or to the high temperature of the retort in which such a large percentage of hydrogen was produced. This seems to be the only way to reconcile results so diametrically opposite as those obtained by such reputable experimenters as Bloxam and Perthius. Bearing on this are the experiments of Bergmann, in which he found, in a mixture of carbonic oxide and ammonia, that 4 per cent. of the nitrogen was converted into cyanogen at 800° C., and 24 per cent. at 1000° C., and that when illuminating gas came to be added to the mixture, the proportion of nitrogen changed increased to 60 per cent.

The sulphur existing in the coal is probably all combined with iron in the form of iron pyrites—FeS_2, possibly Fe_3S_4. During the distillation, this sulphur combines initially with carbon to form carbon disulphide, or with hydrogen to form sulphuretted hydrogen. These compounds then pass on or enter into further reactions. But what of the iron? Part of the sulphur combines to form sulphocyanides; but does the iron enter into combination as ferrocyanide? It seems not. The iron cyanogen compounds easily decompose at a red heat, as is well known and made use of in the ordinary method of making potassium cyanide from potassic ferrocyanide. Hence it is doubtful if the compound is formed at all; and, if formed, it could not maintain its existence. At any rate, but few, if any, authentic cases are on record showing ferrocyanide in crude gas as it leaves the retort or the hydraulic main.

While on the subject of ferrocyanide in crude gas, let me request those managers who are interested to make a few tests to ascertain some facts. They can be easily performed, and, though with old methods, will give good results. There are certain questions which must be solved at the works, and on the gas as made there. A few tests carried out occasionally will help, especially if they can all be collated and arranged so as to classify the results.

Provide three flasks with the ordinary glass tube and rubber connections for the stoppers. Have a little wooden stand made to hold them and to carry them round in. For cyanides in the gas, use a flask containing a mixture of ferrous sulphate and caustic potassa or soda. Pass the gas through it, then warm it slightly, and acidify with hydrochloric acid. A blue precipitate indicates cyanogen present. For ferrocyanides, use a flask containing a dilute solution of ferric chloride. Pass the gas through this, and a blue precipitate will show ferrocyanide. For sulphocyanides, use the third flask, containing a weak solution of ferric chloride. A blood-red coloration indicates the presence of sulphocyanogen. This colour is not affected by hydrochloric acid, but is destroyed by nitric acid. These tests can be easily made, and will take very little time. Let the gas bubble through for ten minutes or half an hour, and attend to something else meanwhile.

After the gas leaves the retort, it passes through the hydraulic main, the condensers, and the scrubbers or washers, without undergoing much change in composition in the portions that are now under consideration.

As a side remark, it may be said that the absence of ammonium cyanide in the ammoniacal liquor is worthy of mention. Ferrocyanide and sulphocyanide are found; but why no cyanide? The most plausible explanation seems to be that the hydrocyanic acid is very weak under the conditions, and that the carbonic acid and other acids force it out from its ammonium combination.

When the gas reaches the purifiers, that series of changes and decompositions commences about which so much has been written and so little actual knowledge gained. Once in a while someone will experiment with a purifying-box and obtain results that count; but unfortunately most of the experiments are made on pure oxide, pure sulphuretted hydrogen, or else illuminating gas so saturated with sulphur that it might as well be all sulphur, and we are coolly informed that these conditions duplicate those of the purifying-box. Perhaps I use the word "duplicate" incorrectly, and should say quadruplicate, as the impurity is increased fully up to that amount. As long as this goes on, we shall continue to have explanations that do not explain. To ascertain what is going on in a manufacturing process involving many elements and impurities, we must experiment on the substances used as they exist, with all the crudities of the manufacture, and not as we should like to have them. Anything else is mere child's play, and usually leads to incorrect deductions.

The most trustworthy experiments yet made show that the cyanogen unites with the iron in the purifier and forms ferrous cyanide. This is usually described as of a greyish-blue colour, rapidly becoming blue from the absorption of oxygen and the formation of prussian blue. The colour is all right; but is it due entirely to ferrous cyanide? This is doubtful, since pure ferrous cyanide is of a yellowish-orange tint, with a slight grey at times. A slight oxidation turns it bluish-grey; a full oxidation turns it blue. It looks as though the cyanide formed is not true ferrous cyanide, according to the equation—

$$FeO + 2NH_4CN = Fe(CN)_2 + (NH_4)_2O$$

but something else. What is it? The iron in the purifying-box is there as a hydrated sesquioxide, $Fe_2O_3(H_2O)_n$; and yet the first part of the above formula calls, not for sesquioxide, but protoxide. Where has the oxygen gone, and what made it drop out? We are not told. It looks as though the formula maker could not prove his theory with the Fe_2O_3, and so changed it to FeO, which worked all right.

Does not this formula account for the facts as well, if not better?

$$Fe_2O_3 + 4HCN = 2Fe(CN)_2 + 2H_2O + O$$

the probable formula, or, alternatively—

$$Fe_2O_3 \times 4NH_4CN = 2Fe(CN)_2 + 2(NH)_2O + O$$

That is, the iron sesquioxide and the hydrocyanic acid form ferrous cyanide, water, and oxygen; and then the extra oxygen unites with some of the cyanide to form prussian blue, according to the accepted formula—

$$9Fe(CN)_2 + 3O = Fe_2O_3 + Fe_7(CN)_{18}$$

Ferrous cyanide. Prussian blue.

This explains the actual condition of affairs. It takes the sesquioxide, and not the protoxide; it produces a mixture of ferrous cyanide and prussian blue, which would answer the description given, which description pure ferrous cyanide does not satisfy.

If ammonium cyanide occurs in excess, we should have ammonium ferrocyanide formed—

$$Fe(CN)_2 + 4NH_4CN = Fe(CN_5)(NH_4)_4$$

That ferrocyanogen exists in the sponge may be easily ascertained by treatment with water and testing the solution. If found, it will be ammonium ferrocyanide, as this is the only soluble ferrocyanide possible under the circumstances (of course, potash, soda, lime, &c., are supposed absent). After a thorough washing of the mass, treat it with a weak caustic liquor (potassa or soda); and this liquor will show the cyanide due to the prussian blue existing as such in the material.

The cyanogen may also become fixed in the i on mass through the agency of ferrous sulphide, which could be formed from the iron sesquioxide and the sulphuretted hydrogen. This undoubtedly accounts for a portion of it; but how much, cannot be said at present.

$$Fe_2O_3 + 2H_2S = 2FeS + 2H_2O + O; \text{ and then,}$$
$$FeS + 2HCN = Fe(CN)_2 + H_2S, \text{ or}$$
$$FeS + 2NH_4CN = Fe(CN)_2 + (NH_4)_2S$$

If ammonium cyanide be in excess, we should have, as before, the formation of ammonium ferrocyanide.

That these reactions take place is shown by the fact that, after the formation of a quantity of ferrous sulphide, and the subsequent thorough removal of the extra sulphuretted hydrogen by an inert gas, passing a gas containing cyanogen causes the reappearance of sulphur at the outlet. Here also we see further that it is possible to find sulphuretted hydrogen in gas after traversing an old purifier, though it contained none when it entered.

I have spoken of the occurrence of sulphocyanogen in the crude gas, and how it is probably produced. The presence of this form of cyanogen in the gas may account for its presence in the purifying material; but it does not account for all, as it may be formed, and quite easily, in the box. A current of gas containing cyanogen, either in a simple or a compound form, will have a tendency, on meeting sulphur, to decompose and unite with it, especially if it is free or in a loosely combined condition, and form a sulphocyanide. This reaction takes place under a slight increase in temperature, and more readily in the box than in a small test sample in the laboratory. That we do have a slight increase of heat is known, and that, under the very complicated conditions of heat, moisture, crude gas, sulphur, ammonia, iron oxide, &c., the formation of sulphocyanogen compounds occurs according to the universal law of combination, in virtue of which the most stable compounds in mixtures are formed and exist. Sulphocyanides are the most permanent and stable compounds in this case, and hence are always formed.

The conditions in the purifier are exactly the same as those cited. The gas is there, carrying the available small proportion of cyanogen compounds; the sulphur is there as carbon disulphide, hydrogen sulphide, or free sulphur; ammonia is there; we have more or less moisture; and we have some heat. Then all the elements needed are present and active.

The presence of sulphocyanide in the crude gas has been denied, and experiments have been shown to prove its absence. But one positive proves more than a dozen negatives; and the fact that it has been found shows the possibility of its production, even if it is not produced in every instance. In cases where its absence was shown, its presence in the purifier was noted; substantiating the statement that the purifier is the principal producer of the sulphocyanogen compounds. There is a great need of more definite experimental results on this point; and it is to be hoped that ere long they will be taken up and followed till the question is satisfactorily settled.

Sulphocyanides are more permanent than either cyanides or ferrocyanides, so that we may expect their formation whenever possible. Probably some sulphocyanogen is derived from the interaction of carbon disulphide and ammonia, according to the formula already given, or from carbon disulphide and ammonium sulphide, according to the formula—

$$CS_2 + (NH_4)_2S = CNSNH_4 + 2H_2S$$

But this cannot be a large quantity in comparison with that produced as above.

It is evident that if we wish to keep down the percentage of sulphocyanides, we must keep low the quantity of ammonia passing into the box. Of course, under the present conditions, we cannot keep it all out; but we should try to keep it as much as possible where it belongs, and where it can be turned into money—viz., in the ammoniacal liquor.

In closing, it will be well to summarize a few of the facts stated above, so as to present them more sharply and connectedly—

1.—Cyanogen exists in crude gas as hydrocyanic acid, ammonium cyanide, or sulphocyanide.
2.—Ferrocyanides do not exist in crude gas.
3.—Prussian blue is formed in the purifier under ordinary circumstances only in small quantities; on the admission of air, it is formed from the oxidation of the ferrous cyanide.
4.—Sulphuretted hydrogen may be taken up by a gas in passing through an old purifier.
5.—Sulphocyanides may form in the purifier when no sulphocyanogen exists in the gas.
6.—Ammonia favours the formation of sulphocyanides.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.—Simpkins, E., of the Wool Exchange, E.C. No. 23,600; Oct. 23, 1896.

According to this invention, the screw-threaded spindle of a meter carrying a toothed wheel is normally locked, but can be released on the insertion of a coin, and can then be given a single complete turn, after which it again becomes locked. In this turning movement, the wheel travels along the spindle for a certain distance without being rotated. When the meter is at work, the wheel is caused to rotate on the spindle and travel back again along it in the opposite direction, and eventually shut off the gas supply from the meter by acting on suitable mechanism.

Fig. 1.

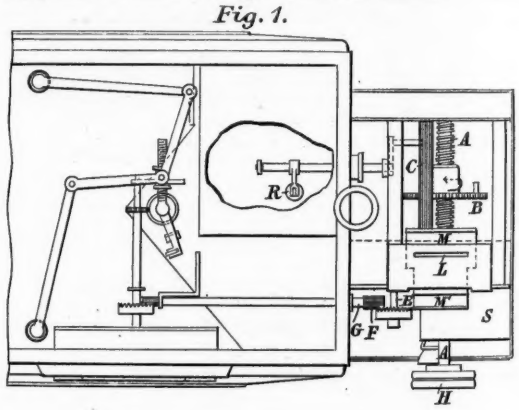


Fig. 2.

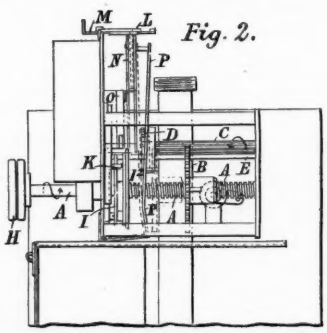
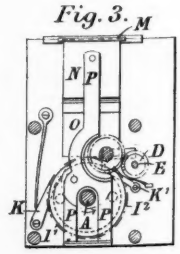


Fig. 3.



In the illustrations, A is the screw-threaded spindle; and B is the toothed wheel thereon—the hub forming, as it were, a nut for the spindle. The wheel B engages with, and is driven by, a long toothed pinion C, which is in gear, by means of a pair of toothed wheels D, with a shaft E driven by a crown wheel and pinion arrangement F, from one of the spindles G of the meter mechanism. H is a milled head or knob, with which the spindle is furnished for the purpose of enabling it to be turned a complete revolution by hand after the insertion of each coin—this turning being as shown by the arrows. On the spindle is arranged a set of discs I I^1 I^2 (for a purpose hereafter mentioned), connected together so as to form one piece.

The spindle is normally restrained from turning in either direction by

means of a pair of oppositely arranged pawls K K¹, which are caused by springs to engage in notches formed in the disc, and thereby act as a device for locking the spindle. These pawls are, however, so set that they allow a small amount of play, so as to permit the coin between the discs I I¹ to exert a wedging action on the pawl and disengage it at the commencement of a rotation.

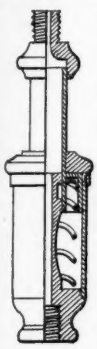
L is the coin-slot formed in a plate, beneath which is arranged a sliding plate or drawer M carrying a coin-shoot N. This shoot has a tail or extension extending downward to the disc I², and of such a length that it will only pass the disc at the notch shown. O is a stationary guide or shoot, which extends downwards, and serves to direct the coin into the space between the discs I I¹. When the parts are in the position shown in fig. 2, and a coin is inserted in the slot, it falls into the shoot N, and rests upon the platform; being prevented from passing out of the shoot until the plate M is drawn to the left, and the shoot brought over the guide O. The coin then immediately falls down the guide, and lodges between the discs I I¹. As the tail of the shoot N can only pass through the notched part of the disc I², it is impossible to move the plate or drawer M as described and drop a coin into the guide O, until the discs I I¹ are in a position to receive the coin.

The device for preventing the insertion of any more coins than the full number the meter is adapted to receive in succession, comprises a lever P, forked at its lower end, and its upper end provided with a pin, which is adapted to enter an aperture in the side of the shoot N, as indicated by dotted lines in fig 2, thereby preventing the insertion of a coin. The lever P also carries a pin, against which the wheel B bears when moved laterally into its extreme left-hand position, as indicated by dotted lines in fig. 2, thereby causing the lever to turn on its pivot and press the pin into the coin-shoot. The pin then acts as a stop to resist the insertion of a coin into the apparatus.

R is the stop-valve of the meter, the stem of which is connected to an arm on a spindle furnished with a crank pin, with which a lateral stop on the toothed wheel B engages when the wheel is in its normal or extreme right-hand position, and thus keeps the valve closed. When, however, the wheel B is drawn back, by revolving the spindle A, the crank-pin is released and the gas-valve is free to open. The return of the wheel to its normal position by the working of the meter brings the stop again into engagement with the pin, and re-closes the valve.

Anti-Vibration Device for Gas-Burners, &c.—May, G., of Monk Street, Westminster. No. 25,541; Nov. 13, 1896.

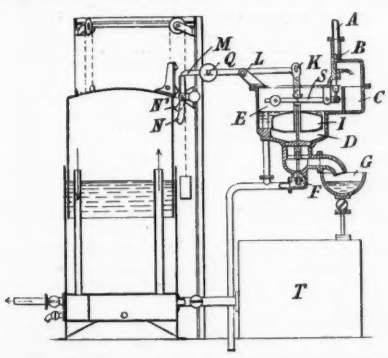
The illustration shows the apparatus in side elevation, partly section. It consists of a cylindrical case to support the burners, open at its upper end, and screwed at the base. The bottom part is detachable, perforated in its middle, and provided with a concave tube fitted with a stuffing-box, which projects downwards and upwards from it. The tube is made in one piece, with the base downwards; the inner part merely forming a socket for fixing the case to the inlet-tube, while the upward projecting part of it ascends inside the case till a little above the upper edge of the cylindrical wall of the case. In the upper part of the case is enclosed a thin circular disc, with a downward-turned flange which fits exactly to the wall of the case, so as to slide easily up and down inside it. The disc is perforated in its central part by a smaller cylindrical tube projecting downwards and upwards, and forming one piece with it. The downward-projecting part is arranged to telescope with the upper tube of the base of the case, when the flange disc slides up and down in it. During this sliding motion, the flange disc, with its telescopic tube, is under the influence of an upward-acting spring and the flange of the disc, and is lodged freely inside it with its bottom part resting against the base of the case, and its top pressing against the disc.



The effect of this construction is evident. Through the action of the spiral spring, the sliding flange disc (with its tubes) is pressed softly against the closing cap of the case. But by any vibration whatever, the spring will give way, and the sliding disc (with its tubes) will play vertically inside the case without disturbing the communication between the inlet and outlet; this being ascertained during the motion by the telescoping tubes, &c.

Generating Acetylene.—Wetter, J.; a communication from G. Meyer, of Zurich, Switzerland. No. 27,212; Nov. 30, 1896.

This invention in acetylene gas generators consists in the combination of a gasholder with an automatic water-feeder or feed-regulator, adapted to supply to the generator proper a measured quantity of water, when the volume of gas in the holder falls below a given limit.



The water serving for the generation of the gas flows from the water-feeder and regulator into the generator proper T; and the gas produced passes into the bell of the gasholder shown. The water-feeder is connected with a high-level tank or pressure supply by means of a pipe A, fitted with a feed-valve B. When the latter is open, the water flows first into a side compartment C, separated from the principal water chamber by a partition. The latter has a small opening, through which the water enters the principal chamber, where the water rises up to the edge of the overflow-pipe E, if the discharge-valve D is closed. The latter is rigidly connected with the safety-valve F, in such a manner that the valve is closed when D is open, and D is closed when F is open. As the outlet from the water-feeder towards the generator is situated above the valve F, and the latter opens into a waste-pipe, which also receives water from the overflow-pipe E, any accidental escape of water into the generator, in case the valve D should leak, is prevented. The normal discharge-pipe from the water-feeder or regulator leads to an open cup G, from which the water is led into the generator at the desired speed, through a feed-pipe provided with a regulating-tap. The chamber of the discharge-valve D contains a large float I, situated axially above the valve, and mounted on a tube through which the valve-spindle passes. The latter is wide enough to afford the necessary clearance for the motion of the spindle; and it terminates at top in a slotted fork. The upper end of the valve-spindle is also slotted; and both the tube and the spindle are so connected with pivotal studs K of a weighted lever L, that either of them may lift and lower the lever (within given limits) independently of the other, and may be lifted and lowered independently by the lever.

The lever connects the water-feeder with the gasholder bell by means of a pair of triggers N N¹, adapted to support the extremity M of the lever L, and to come in contact with a pair of lugs or projections formed on a bracket fixed to the top of the holder bell.

The use of the two triggers placed side by side has for its object to prevent the trigger mechanism from being released and a discharge of water produced during the up-motion of the bell—that is, at the wrong time. The trigger N¹ is therefore slightly shorter than the trigger N; and as the bell rises, the former is only disengaged after the latter has already turned back, so as to prevent the lever L from dropping.

The illustration represents the water-feeder just after it has been emptied. Water continues to flow from the cup G into the generator T, where it produces gas which causes the holder to rise rapidly. The lever L rests on the trigger N, under the influence of the weight Q and the buoyancy of the float I; the feed-valve B is closed; the lateral compartment C has been emptied; the excess of water has escaped through the overflow-pipe E; the safety-valve F is open; and the water-feeder is ready for a fresh discharge. When the water has flown out of the cup G, and the production of gas in the generator has been completed, the holder occupies its highest position, provided that during the generation of gas the consumption has been interrupted. If, however, the consumption of gas has continued, the bell begins to drop already before reaching its highest position, and continues to do so until the trigger N has been pushed back by its contact with the projecting face, and thereby the end M of the lever L has been released.

Pressure or Vacuum Gauges.—Stagg, W., of Bristol, and Glover, R. T. & J. G., of Clerkenwell. No. 29,318; Dec. 21, 1896.

This invention has for its object to obviate certain inconveniences arising from the use of pressure or vacuum gauges hitherto constructed—for instance, it has been necessary to add the readings above and below zero of the gauge when at rest to the readings after the observation, thereby leading to mistakes or inconvenience. According to this invention, the zero position of the gauge is absolute under all circumstances, notwithstanding any difference in the volume of water employed in the gauge.

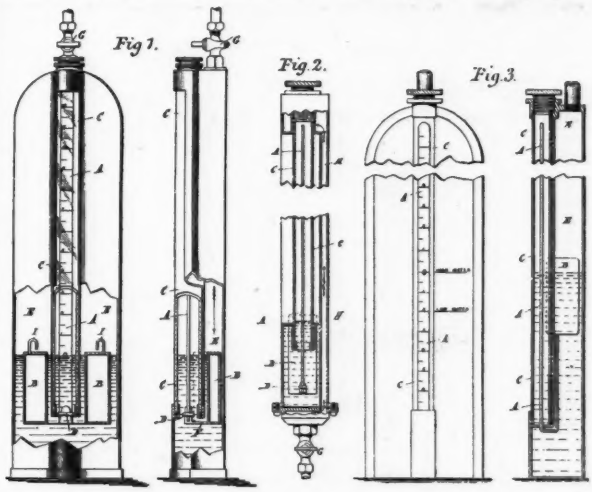


Fig. 1 is a part sectional front elevation and a part side elevation of a pressure-gauge, where the gas enters from the top, and showing the relative positions of the float and index or scale when at zero. Fig. 2 is a sectional side elevation of a pressure-gauge when the gas enters from the bottom, and in which two connected floats are employed. Fig. 3 is an elevation and a sectional side elevation of a pressure and vacuum gauge.

In carrying the invention into practice, the scale A upon which the readings are marked is attached to a float B, with the zero of the scale corresponding in position with the level of the water-line of the immersed float or floats B; whereby it follows that any increase or reduction in volume of the indicating fluid has no effect upon the registration of the zero position with the water-line. The scale is preferably carried within the glass tube C, wherein water rises or falls to indicate the pressure or partial vacuum as the case may be; and the scale may be connected in any suitable manner—such as by a band D or a wire—to the floats contained within a chamber E of relatively large capacity, behind or connected to the indicating tube C and the pressure positive or *minus*. The gas to be tested is led in upon the top of the fluid in which the float is partially immersed for forcing or withdrawing the fluid into or from the

indicating-tube, thereby causing the upper surface to register upon the scale either above or below zero, and render a direct and immediate reading to the observer without calibration of the instrument.

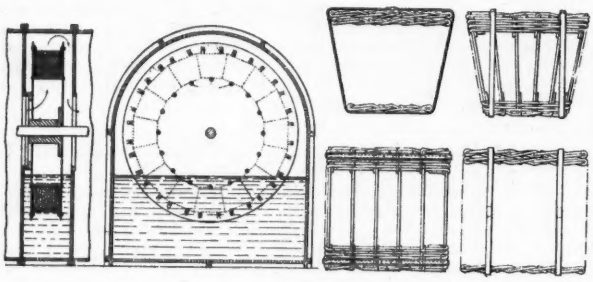
In fig. 1 only one float is shown, which has a hollowed side and at its base a projecting piece F for carrying the scale about flush with the sides of the float. Fig. 2 has two floats, connected at their base by a strap or bridge-piece F, which carries the scale A. The apparatus is constructed for the gas to enter at the bottom by the tap G, and pass up the pipe or channel H to enter the chamber E. I are air-ducts to the floats; but they may be dispensed with if desired. In both these types, the apparatus is constructed for pressure only; the gas entering by the tap G, and, acting upon the water in the chamber E, forces it up the tube C—the top of the water indicating by the scale the amount of pressure applied.

In fig. 3 the apparatus is constructed for vacuum as well as pressure. In this case, the scale A is continued below the float (zero being about mid-distance); and by a return or bent portion, it is connected to the float so that, when pressure is applied, the water rises up the tube, but when a vacuum register is required, the action of the water is the reverse—the float and scale remaining stationary by reason of its bent portion engaging the partition between the glass tube C and the casing E.

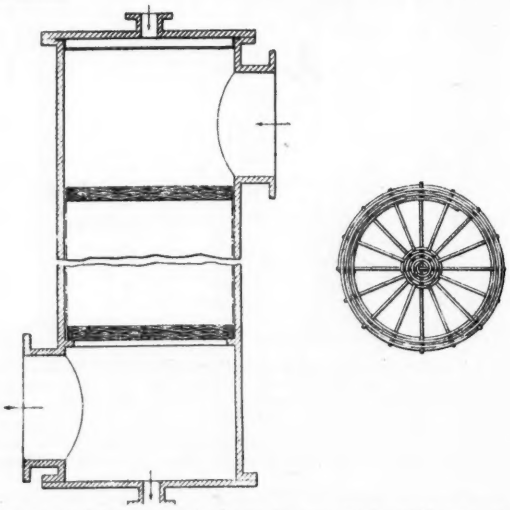
A further application of the principle, say the patentees, allows of an arrangement whereby the resistance to the flow of gas or other fluid through a piece of apparatus or manufacturing plant—such as a set of purifiers—may be continuously shown. This is made possible by combining the inlet and outlet pressures in one gauge. The resistance will then be shown by the difference of levels of the water; and provision may further be made for registering also the full inlet or outlet pressure at the apparatus.

Gas-Cleansing Apparatus.—Spurge, J., of Walthamstow. No. 29,603; Dec. 23, 1896.

This invention, relating to apparatus for washing and scrubbing gas, consists in constructing the washing surfaces of wicker-work, the wattled structure of which, the patentee says he has found by experiment, has "a most efficient action in retaining the water and presenting a continuously wetted surface for contact with the gas, whereby the washing and scrubbing of the gas is rendered more complete than when wetted surfaces formed of plates, brushwood, perforated sheet metal, or other devices, are employed."



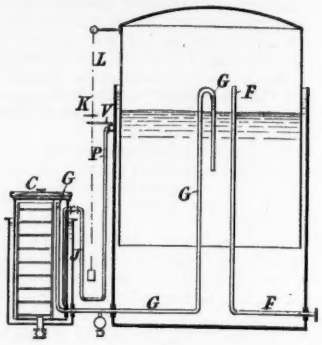
The above illustration shows a vertical and cross section of one compartment of a horizontal washer provided with such wicker-work surfaces; also details of the arrangement of wicker-work. The several pieces of wicker-work in each bundle or section may be arranged one upon the other so that they form a series of layers practically concentric with the shaft, or they may be arranged vertically so that they form practically a series of parallel discs. In either case, the several pieces of wicker-work of which each bundle is composed are bound together by metal bands.



In the second illustration is shown in a vertical scrubber a series of superposed layers or diaphragms of wicker-work corresponding in shape with the tower in transverse section; the layers in this case being represented as of circular shape. The wicker-work diaphragms are maintained in a wetted condition by water introduced at the top of the tower through the perforations of a plate in the usual well-known manner.

Producing, Drying, Purifying, and Storing Acetylene.—Dargue, W. H., of Newcastle-on-Tyne. No. 29,768; Dec. 28, 1896.

In this apparatus (as shown in the engraving), the water for the decomposition of the carbide of calcium is contained in a cylinder or generator C, encased in a water-jacket J, and arranged adjacent to the gasholder tank, which provides means for absorbing the heat generated during the decomposition of the carbide. The container C is provided with a number of shelves to support the remaining carbide as the lower portion decomposes. For supplying water at the proper time to the carbide container, a pipe P is led from the tank. It enters at its upper part, and passes down to its base. Upon the pipe is a self-closing valve V, adapted to be operated by a stop K carried by a chain or rod L attached to the gasholder. The gas generated is led from the container C by a pipe G, passing into the tank and up into the holder; a bent portion providing a water seal to prevent any return of the gas. The gas for consumption is drawn off by the pipe F.



In operation, when the holder falls on gas being consumed, the stop K comes against the lever of the valve V and opens it, being assisted by the weight of the holder; or a weight may be provided if desired. Water then passes by the pipe P to the container C; a corresponding quantity of carbide is decomposed; and the gas generated passes by the pipe G to the holder, which then rises and allows the valve V to shut off the water supply until the holder again falls.

Gas-Motors.—Romer, J. A., of Peckham, S.E., and Perkes, H. H., of Strand, W.C. No. 30,162; Dec. 31, 1896.

This invention relates to the arrangement, in conjunction with the ordinary single-acting trunk piston, of an auxiliary piston, and its means of reciprocation, so that the "Otto cycle"—that is, the exhaust of burnt products, the suction of a new charge of explosive gas, the compression of same, and their final explosion and expansive working—may be effected in one complete revolution of the main crank-shaft.

Two open trunk pistons are provided in one open cylinder. One piston is of the usual single-acting type, and operating upon a main crank-shaft by the ordinary connecting-rod; the other or auxiliary piston is of the same type, placed in the open rear mouth of the cylinder, and reversely to the main piston. This auxiliary piston is reciprocated by a rocking lever, connecting links, and a rocking kite-piece, embracing two right and left handed cams upon the crank-shaft, and giving it positive backward and forward motion. The peripheries of the cams are so set out that the auxiliary piston may be given such periods of rest in the double stroke of the auxiliary piston as may be required, and intermittent periods of reciprocating travel between these periods of rest. One period of rest is at the time of the compression and explosion of the gaseous charge; and at the latter moment it is arranged that the auxiliary piston rests at its extreme outward travel against an abutment or cushion, to take the shock of the explosion.

When the explosive and expansive stroke of the main operative piston has been completed, the auxiliary piston (having commenced its inward travel towards the operative piston) is caused to rapidly complete its travel towards the operative piston when the latter is almost upon its dead-centre, and thus to eject the exhaust products, as completely as may be desired, through an exhaust-port, towards the forward end of the cylinder, which is covered and uncovered by the main piston itself, or else controlled by an exhaust-valve.

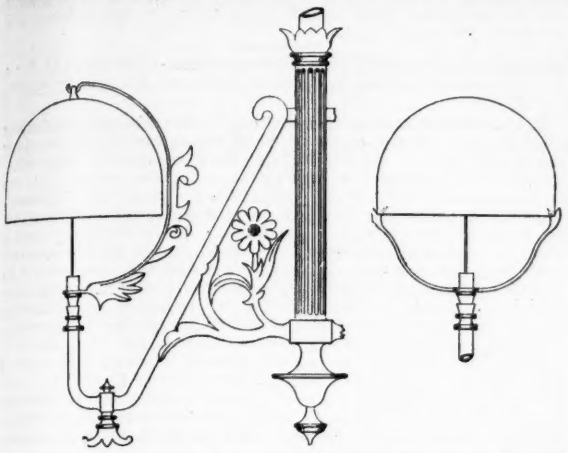
The auxiliary piston, after the discharge of the products of combustion, reverses its movement, and recedes rapidly from the main piston—thus inducing a suction between the two pistons so as to admit a fresh charge of explosive gas. When the auxiliary piston has completed its suction travel, it comes to rest upon the outer abutment or cushion, and receives there the pressure of compression of the explosive gas caused by the inward travel of the main piston towards the auxiliary piston; and finally the auxiliary piston, having been driven home by the compression upon the outer abutment or cushion, receives there the recoil shock of the explosion, caused by any convenient ignition device.

Combination Canopy Globe and Gas-Bracket.—Bray, G., of Leeds. No. 97; Jan. 2, 1897.

Explaining the object of his invention, the patentee says: Hitherto globes for gas-lights have been formed so as to give a through draught, causing concentrated currents of heated air, products of combustion, smoke, and other dirt particles with which the air is always more or less charged, to pass through the top opening, and impinge upon the ceiling of rooms lighted. Moreover, the globes almost wholly cover the gas-flame; thus absorbing a large amount of light which would otherwise pass into the room.

The patentee proposes to use a globe of special form shown, which he terms a "canopy globe," and which is fixed in certain relationship to the flame. The main functions of the globe fundamentally differ from those hitherto performed by globes, as it allows no current to pass through it—being closed at the top. Moreover, it is fixed in such a position in relation to the flame that practically the whole of the flame is uncovered, excepting at the top, instead of being covered as in existing globes. The light thrown downwards is thus materially increased. Another advantage derived from the use of the globe, and from the position in which it is fixed in relation to the flame, is that a material quantity of the heat reflected from it is communicated to the flame, and at the

same time (owing to the diminution of the upward velocity of the draught) less heat is extracted from it. The complete combustion of the carbon is thereby facilitated, says the patentee; and the flame is made "more

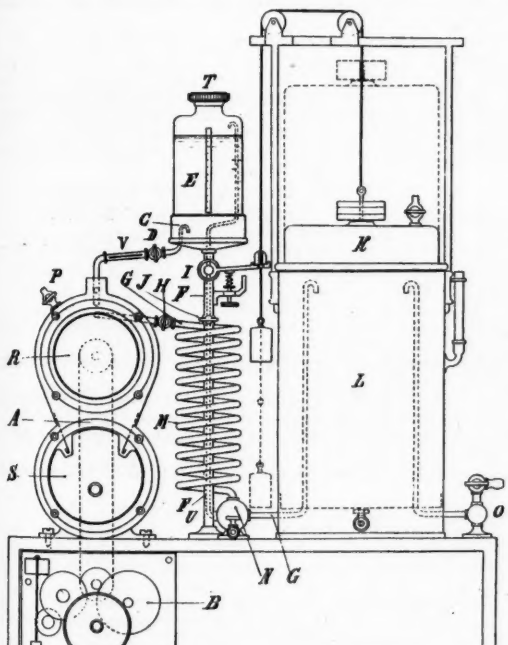


brilliant and less smoky, and consequently gives a better and pleasanter light, and has less effect in discolouring the ceilings."

The best position in which to fix the globe in relation to the flame is such that a line drawn across the bottom of the globe cuts through the top of the flame.

Producing Acetylene.—Lebrun, G., and Cornaille, F., of Paris. No. 512; Jan. 7, 1897. Date claimed under International Convention, June 17, 1896.

In this apparatus, the carbide of calcium is agitated within a revolving cage while water is projected upon it, in order that the residue of wet lime resulting from the decomposition may be separated from the carbide and the action of the water be rendered instantaneous and regular, also that the production of the gas shall be arrested when the supply of water ceases.

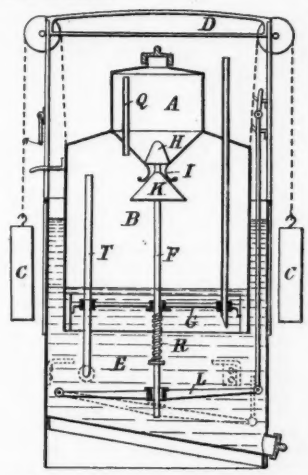


The apparatus comprises a generator formed by a closed metallic casing A, provided with two apertures R S (one above the other), closed by rubber-packed covers secured by screws. The upper opening R is for the introduction of a rotary cylinder of wire gauze, acting as a sieve, and containing the carbide, together with a few balls having conical sleeves for preventing the clogging of the meshes. The lower opening S is for the introduction of a tray, for receiving the lime residue resulting from the decomposition of the carbide. The cylindrical cage containing the carbide is mounted on a revolving shaft, driven by an endless chain from mechanism B contained in the base. A water-jet pipe C, leading from the reservoir E into the generator, is provided with a regulator V, to control the supply according to the normal production of gas. The glass feed-reservoir E, which is closed air-tight for retaining the water by the vacuum, is graduated to show by the consumption of water the degree of exhaustion of the carbide. A pipe F, connected to the pipe G from the generator to the gasholder, admits gas to the reservoir to permit the water to escape to the generator. The pipe F has a valve I, controlled by a counterbalance weight operated by the rise and fall of the ball K of the gasholder L; the valve being opened by the fall of the holder, and closed when it rises to its maximum height. The coil M of the pipe G leading from the generator to the gasholder is for cooling the gas, and condensing the vapour. N is a purge cock.

When in action, the stop-cocks H J D are closed, and the air-vent P of the generator open; the covers R and S, and stopper T, are removed; and the cage, charged with carbide and balls, is placed in position—the tray emptied if necessary, and the reservoir E filled with water and closed. The covers are then closed; the clockwork wound; and the cocks J and D opened. The gasholder being at this moment in the lowered position, the cock I is opened, and gas enters the reservoir E to allow water to be projected upon the carbide; and, the revolving cage being set in motion, the generation of gas takes place. When the air contained in the generator has been allowed to escape, the vent P is closed and the cock H opened; the gas generated passing to the gasholder, which begins to rise. When the consumption of gas is interrupted, or is less than the production, the holder continues to rise, until, on reaching its normal limit, the counterweight closes the valve L, so that the gas being shut off from the reservoir E the supply of water to the generator ceases. The carbide receiving no more water, and being freed by the rotation of the cage from the residue of wet lime which falls into the tray, becomes inert. The production of gas thus entirely ceases until, on the consumption recommencing or increasing, the holder descends, and the valve is reopened, whereupon the action is renewed until the charge of carbide in the generator is completely exhausted.

Production of Acetylene.—Thompson, W. P.; a communication from P. P. H. Macé and L. L. H. Gérard, of Paris. No. 3013; Feb. 4, 1897.

In this apparatus finely crushed calcium carbide is contained in a receptacle A, arranged in the upper part of a gasholder B, the diameter of which is sufficiently great not to allow the decrease of weight resulting from the consumption of carbide during a given period of time to sensibly modify the pressure of the gas produced. The bell is strongly weighted in its lower part by a metal ring, and is partially counterbalanced by weights C fixed to chains, passed over pulleys on supports D, at the top of the bell, so as to avoid the use of guide-rollers. The bell is immersed in a water-reservoir E, having an inclined bottom to facilitate the discharge of the mud or waste.



The automatic feed arrangement consists essentially in the use of two cones mounted on a weighted and guided rod, and acting one above, and the other below, the discharge opening of the carbide-container. For this object a rod F is employed, guided by a cross bar G, and having at its upper end a cone H forming a valve, which serves for regulating the discharge of the carbide. The bottom of the container is in the form of a hopper, terminated by an opening I, having a double tapering form. At a short distance below the opening, a second cone K, of larger dimensions, is arranged on the rod F. This rod is constantly depressed by the weight of the cones H and K, and by the action of a spiral spring R. It passes through an opening in the centre of a fixed horizontal lever L.

The working of the arrangement takes place as follows: When the cone or upper valve H is lowered, it prevents any discharge of carbide into the water of the reservoir E; but when, in consequence of the discharge of gas by the discharge-pipe T, the bell B descends, the stop on the pipe F encounters the level L, and the rod is raised. The upper cone H, being also raised, causes the fall of a certain quantity of carbide, and consequently the production of a corresponding quantity of gas. As soon as the bell rises, this cone or valve closes under the action of the spring R and interrupts the feed, until another lowering of the bell produces the same action.

In order to allow the free flow of carbide, the moment the upper cone H rises, a tube Q establishes communication between the upper part of the carbide reservoir and the bell; and this ensures equality of pressure of the gas above and below the discharge opening I.

The action of the lower cone K, moveable at a short distance below the opening I of the carbide-container, may now be explained. As soon as the bell B has descended to a certain extent, this second cone K closes the lower part of the opening I, and interrupts the supply of carbide. As soon, however, as the bell rises, it again allows a certain quantity of carbide to pass through up to the moment when the upper cone again closes. In this manner, the fall of carbide is divided into two successive periods, which division renders regular the production of gas, and avoids any sudden variation of pressure in the apparatus.

The lower cone K, the diameter of which is of considerable size, has also the effect of distributing over a larger surface of the liquid the carbide, the fall of which at a single point would cause a sudden effervescence of the water and a deleterious release of the gas.

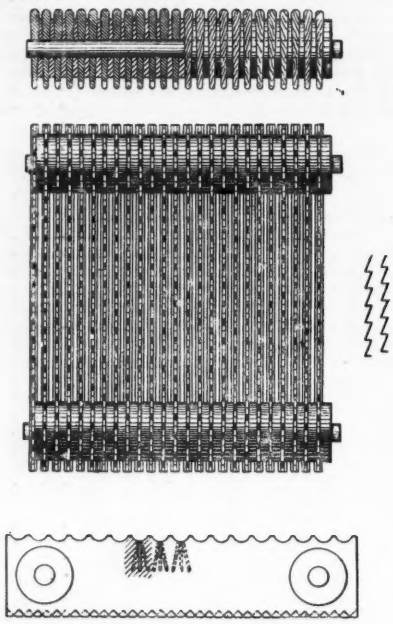
Another improvement consists in an arrangement of catches serving to keep the bell fixed during the charging of carbide into the container. These catches or spurs, when the holder is raised a certain extent, engage in rings pivotally arranged on the supports of the counter weights.

In order to effect the charging of the container with carbide, the bell is

sufficiently raised to allow the pressure of gas which it contains to become equal to the pressure of the atmosphere, and of its being kept fixed at this height by means of catches mentioned. The carbide reservoir may then, without trouble, be opened and filled. When the operation is completed, it suffices to release the two catches which maintain the bell in its raised position, in order to allow the apparatus again to commence working in the manner already described.

Grids for Purifiers, Scrubbers, &c.—Zschocke, G., of Kaiserslautern, Germany. No. 3219; Feb. 6, 1897.

This invention relates to hurdles or grids for gas purifiers or scrubbers or for containing materials to be acted upon in graduating, cooling, and drying apparatus.



Each grid consists (as shown) of a number of flat bars placed on edge. The upper and lower edges are rounded and tapered in thickness from the upper to the lower edge—the latter being formed with serrations so as to produce flat blunt points arranged to be out of line in contiguous bars. On the upper edge, a number of recesses or notches are formed, in which liquid poured over the grid will be retained; and in order to increase the surfaces of the bars, the vertical sides are made with ribs or flutings, or borings partially down through the bar from the recesses or notches in the top edge may be extended laterally at their bottoms with openings at the sides of the bars. The bars are connected together side by side with narrow spaces intervening, for which purpose disc-shaped distance-pieces may be inserted between them; these, as also the bars, being conveniently provided with holes, through which is passed a transverse supporting bar.

Production of Acetylene.—Jimeno, E., of Barcelona. No. 14,090; June 9, 1897.

This acetylene-gas producer is constituted substantially by two vessels —one above, for the water; the other below, for the carbide of calcium. They communicate by means of a tube wholly or partly capillary (or made so), through which the water leaves drop by drop. The pressure of the gas is regulated by means of the pressure of the water on the gas; and regulation is obtained by the constant pressure—variable at pleasure—given to the water on the escape orifice. This pressure is equivalent to that of the formation of the gas, and is obtained either by placing the air-tube more or less high, fixed or moveable at will, or by the constant pressure (variable at pleasure) operated on the water by the gas which passes to the burner under a regulated pressure.

Means for Inserting Valves in Pipes and Mains, and for Cutting out Sections of Pipes, Connecting Branches, &c.—Allison, C. A.; a communication from M. R. Sherrerd, of Newark, and D. W. French, of Hoboken, N.J., U.S.A. Nos. 17,604 and 17,605; July 27, 1897.

The object of the first-named invention is to enable a valve—such, for instance, as a gate-valve—to be inserted in a pipe or main while the latter is under pressure, without stopping the flow of fluid. It consists in a casing adapted to surround a pipe, and having an opening to permit the passage of the valve that is to be connected with the pipe, combined with means adapted to connect the valve with the pipe while within the casing. It also consists in a casing adapted to surround a pipe, and having an opening to permit the passage of a valve into the casing; a valve to close the opening; and a removable bonnet or cover adapted to contain the first-mentioned valve.

The object of the second invention is to provide means for cutting out a section of pipe, for removing the cutting machine and the section of pipe cut by it, and for sealing up a casing, branch, or valve, around the severed part of the pipe without stopping the flow of fluid through the pipe. One part consists in an improved pipe-cutting machine adapted to cut out a section of pipe; and another part, in a divided or split casing or branch adapted to be clamped around a pipe. It has an internal chamber adapted to surround the pipe, and within which a cutting machine may be operated to cut out a section of the pipe; the chamber having a space into which the pipe-cutter can be drawn. The casing has a removable portion, to enable the pipe-cutter to be removed, and a valve arranged to be closed between the pipe-cutter and the severed pipe, so as to enable the cutting machine to be removed while allowing the fluid to continue to flow through the pipe.

Both specifications are accompanied by several sheets of detail drawings, without the reproduction of which any extended description would not be intelligible. There are 20 pages of printed specifications, and 13 sheets of drawings in all.

Producing Gas from Volatile Hydrocarbons.—Thompson, W. P.; a communication from A. Julien, of Brussels. No. 18,005; July 31, 1897.

This apparatus for generating gas from "hydrocarbons of petroleum or other sources," consists, on the one hand, of a carburettor or generating vessel, which forms "the principal organ of the apparatus;" and, on the other hand, of a group of secondary parts, comprising (according to the applications to which the gas produced is destined) three appliances. One of these serves to put in suitable motion the agitating mechanism of the carburettor; the second, is a gasholder; and the third apparatus is an air container or compressor. The arrangements are not described apart from the drawings. The patentee claims that he obtains "an absolutely intimate mixture of atmospheric air and of the carburetting materials contained in the apparatus, thus supplying gas of uniform density, the composition of which, and its proportion of carburetting materials, can be exactly regulated according to the requirements in consumption and the various needs of the applications for the purpose of obtaining: (*a*) A powerful explosive mixture, suitable for fixed or mobile gas-engines. (*b*) A specially rich gas in heating power, for industrial and domestic heating of all kinds. (*c*) The production of a very powerful lighting flame by means of ordinary burners of any kind, or of incandescent burners of all systems."

Fluid for Impregnating Incandescent Bodies.—Freudenthal, L., of Berlin. No. 20,225; Sept. 2, 1897.

This solution for impregnating incandescent bodies is made as follows: Thorium oxalate is converted by suitable treatment into thorium nitrate, and the latter dissolved in distilled water. To the solution a small quantity of the chlorides of other metals is added; and as soon as a thorough admixture of the substances has taken place, the fluid obtained in this manner is purified and filtered, after which it is ready for use in impregnating incandescent bodies. The choice of the metal chloride to be added to the dissolved thorium nitrate is made, says the patentee, according to the actual requirements—as regards, for instance, strength of light, colour of light, permanency of the light, or durability of the incandescent body.

Producing and Burning Acetylene Gas.—Windmüller, J., of Cologne. No. 21,464; Sept. 18, 1897.

This cycle-lamp acetylene gas producer consists of an upper part which serves as a water receiver, while the always cooled under part is provided with a double wall that serves for receiving the carbide of calcium. It is connected, by an opening on the under end of the under part, with the interior space containing an inserted tubular piece, so that the pressure of the developed gas after the cock is closed is sufficient to hinder the further admission of water, and so interrupt the gas production.

APPLICATIONS FOR LETTERS PATENT.

27,315.—Rowbotham, W., "Explosion engines." Nov. 22.
27,321.—Grove, J., "Gas or other engines." Nov. 22.
27,379.—Talbot, B., and Hughes, W. B., "Gas-producers." Nov. 22.
27,384.—Hill, J. H., and Bright, P., "Making connections with water or gas mains." Nov. 22.
27,395.—Bachner, A., "Igniting gas-jets." Nov. 22.
27,405.—Farrington, R., Hawes, M. H., and Hand, W. H., "Incandescent lighting." Nov. 22.
27,409.—Faissol, A., and Besson, H., "Acetylene gas lamp or lantern." Nov. 22.
27,428.—Riant, H. S., "Production of calcium carbide." Nov. 23.
27,470.—Tucker, P. G., "Protector for gas-burners." Nov. 23.
27,478.—Fleming, E., and Smith, F., "Mixing air and gas for heating and lighting purposes." Nov. 23.
27,536.—Falbe, O., and Borchardt, E., "Acetylene gas-burners." Nov. 23.
27,577.—Pearson, S. O., "Stop-valve." Nov. 24.
27,593.—Jameson, J., "Production of light and radiant heat by combustion of gas or inflammable vapour." Nov. 24.
27,638.—Testelin, C., "Burners for acetylene and other gas." Nov. 24.
27,639.—Lazarus, W. J. H., "Production of acetylene gas." Nov. 24.
27,650.—Boult, A. J., "Acetylene gas generators." A communication from E. J. Armand-Machin. Nov. 24.
27,652.—Bernstein, M., of the firm of J. F. Wallmann and Co., "Automatic igniters for illuminating gas." Nov. 24.
27,654.—Glover, R. T. & J. G., "Gas heating apparatus." Nov. 24.
27,672.—Owen, C. A., "Application of heat to the sterilization of water." Nov. 25.
27,711.—Carpenter, J. H., "Purifying air and gases." Nov. 25.
27,720.—Seiler, M., "Gas-nozzles for bunsen-burners." Nov. 25.
27,762.—Burrell, L., "Rotary engines, also applicable as fluid and gas meters." Nov. 25.
27,767.—Schülke, J. H., "Acetylene gas generator." Nov. 25.
27,869.—Bowing, J., "Manufacture of coke." Nov. 26.
27,872.—Sandwell, W. D., and Evans, J. G., "Explosion engines." Nov. 26.
27,876.—The Liver Acetylene Gas Company, Ltd., and Evans, E., "Generating acetylene or other gas." Nov. 26.
27,879.—Hewitt, C. J., "Prepayment gas, water, or other fluid meters." Nov. 26.
27,931.—Morgan, R., "Rotary engines applicable for exhausting purposes." Nov. 27.
28,001.—Winckler, H., "Increasing the lighting properties of gas and oil flames." A communication from H. Freudenthal. Nov. 27.
28,003.—Billwiller, J. S., "Purifying the products of combustion of acetylene gas flames." Nov. 27.
28,012.—Lake, H. H., "Production of acetylene gas." A communication from W. A. Shearer. Nov. 27.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Gaseous Firing.

SIR,—There cannot be aught else than pleasure in a friendly bout and shake "hands across the sea" (when shall we have another of Mr. Hunt's Christmas cards?) with my old friend Mr. Marshall. He is not less delightful an opponent when he wields the button-tipped rapier of a graceful pen than a companion when he dons the cap and bells.

I cannot but regret that so original and versatile-minded an engineer as Mr. Marshall has proved himself to be, should be so wedded to old-fashioned methods of retort-heating. The furnace under the setting has blocked the way completely to any attempt to modernize the method of firing. It is conveniently placed for "poking in" hourly doses of hot coke, and nothing more. With this constant kicking-up a dust therein, small wonder can it be that the distributing nostrils give trouble by blocking up. Its position is too cramped to permit any modification of its form so as to give automatic and continuous feeding. I cannot help wondering that the Phil May sketch Mr. Marshall has given us of the sorrowful works' chemist vainly trying to pair off the molecules of CO and CO_2, in Bench No. 3, Battery No. 2, should not ere this have prompted an endeavour to ameliorate his lot.

Perhaps, however, there is another and compensating picture which Mr. Marshall has not drawn for us, and that the works' chemist is accompanied in his daily round by a retort-housemaid armed with a feather-headed cane-handled dusting brush to flick the fallen ashes from the flutometer flaps.

Seriously speaking, however, Mr. Marshall and myself have the same aim, if we choose different paths to obtain it. A good balance-sheet is our goal. And, in this, "coke and breeze sold per ton of coal" is an important item. By all means express this if you will as pounds *sold* per hundred pounds carbonized; but to base a whole year's working on experiments made by weighing in fuel to sundry benches is a delusion and a sham.

Mr. Marshall has before now excited my imagination by pictures of the *modus operandi* in some of the leading Continental works. Surely it will not be hard for him to conceive a works breaking for household use the whole of its coke, using the whole of the breeze for retort heating in specially constructed detached producers, automatically charged and automatically clinkered, and from which the heating gas is led to all or any of the settings by the opening or closing of suitable valves.

I hope such an object-lesson will some day be the reason of one of Mr. Marshall's trips to the dear Mother Country.

C. C. CARPENTER.

Vauxhall, Dec. 4, 1897.

The Extinction of Gas Companies.

SIR,—From reports that reach me, I learn that the movement which is going on all over the country for the acquisition of gas undertakings (I say nothing of water undertakings; that side of the question may be left to those more immediately concerned) by local authorities, is becoming more general. The fact is that at the present time there are more negotiations going on for the transfer of these undertakings than ever before. Those who have the control of gas companies, have now always the uncomfortable feeling that any day they may receive a somewhat peremptory request to say whether they are prepared to sell their works. They never know when their turn may come; but the better managed and more prosperous the concern is, the briefer its life is likely to be. Though a company are unwilling to sell, have statutory powers, are supplying good gas at a reasonable price, and faithfully performing all their obligations, yet, in spite of all this, they may still be compelled to part with their undertaking. An eminent Parliamentary Counsel, when addressing a Committee last session, said "they never found a Corporation coming to Parliament to compulsorily acquire possession of undertakings (gas and water) like those now involved, unless they were paying concerns. Corporations always left the risk of beginning the supply to a company, and only came in when they saw their way to grab returns." Yes; it is the "grabbing of returns," with the view of reducing the rates, which is the tempting bait that catches the average ratepayer. Sometimes the pill is a little more difficult to swallow, because the attack is begun and carried through by some local demagogue of Socialistic proclivities. Recently the Chairman of a District Council said to a Director of a Water Company: "We mean to 'ave it"—the "it" being a water undertaking. Then, Sir, when the request comes from the local authority to sell, it requires a good deal of moral courage to say "No." I am speaking of the very considerable number of towns where everybody knows everybody. If the directors have that courage, and a parliamentary fight ensues, then great unpopularity is their lot, and any amount of abuse; and the smaller the town, the more bitter the feeling. I am not drawing a fancy picture. It is from life; and you have a good number of readers who could testify to its strict accuracy.

Surely these are facts demanding the serious consideration of those concerned. To the shareholder, the transfer means the loss of an investment with which he is well satisfied, and often does not know how to replace. To the manager, it may mean the loss of his appointment; and in any case it entails a change of masters—which he usually dreads. But to the unfortunate secretary, it means the absolute loss of his appointment, and not seldom without compensation. It is useless to protest against this movement; but one may be allowed to express some surprise that Committees of the House of Lords can be found who, though nothing can be alleged against a company, will forcibly dispossess them of their undertaking.

But, Sir, the practical question is: Can anything be done to put companies in a better position to resist these forced sales? Well, I think something may, though perhaps not very much. Let us see what are the usual allegations against a company:—

1.—Objection is taken to the company having the right to interfere with the streets.
2.—Exception is usually taken to the price charged to consumers.
3.—The quality of the gas supplied is generally complained of.
4.—Many of the shareholders being persons who live away, and have no interest in the place.
5.—It is said that local authorities can borrow the purchase-money at such a low rate of interest as would result in great advantage both to ratepayer and consumer.
6.—Big dividends.
7.—That it is opposed to the policy of Parliament, which is (it is alleged) against gas and water undertakings being in the hands of profit-making companies.

These then are the points usually raised by the promoting authorities. What is the reply?—

As to Nos. 1, 2, and 3, the case frequently breaks down. For the sake of peace and quietness, companies are bound to take great care that there shall be no just ground for complaint in these matters.

No. 4. This is a sore point with the ordinary ratepayer, and one that is brought up before Committees. It is said: "Oh, you make large profits in the place, and then send them away to be spent elsewhere." One can understand this objection; and every effort ought to be made to meet it. Of course, do as you may the shares will keep getting scattered over a wider and wider area; but in the case of new capital, where the money can be obtained in the district of supply, not one penny ought to be taken from outside. Both for the sake of obtaining supporters and consumers, this policy should be adopted. I believe it has been in connection with that model-managed undertaking, the South Metropolitan Gas Company. (Will Mr. Livesey say how he gets over the auction clauses?)

No. 5. A serious effort ought to be made to meet this objection. One way in which something could be done would be by alteration in the limit of the borrowing powers. The 25 per cent. limit with a company paying statutory dividends, is preposterous. A more reasonable figure would be 75 per cent. Then borrow the money locally, if possible, on small debentures.

No. 6. Much is said about this. The fact that in many cases the bigness is fictitious is never considered. The lesson is obvious—consolidate and convert the capital, so that the dividend shall represent the actual facts.

No. 7. Not seldom so little can be alleged against a company that Counsel is drawn into making this his main argument. From its nature, it is a difficult one to meet. We can protest against such a policy. We can say that it is Socialism pure and simple; and that it involves an injustice to the shareholder who sells the gas, without any advantage to the consumer who buys it. We can ask why our undertakings should be specially selected for Collectivist experiments. But when we have done, we are at the mercy of a Committee who are a law to themselves, and whose decision will largely depend upon whether or no they are in sympathy with this policy, and only to a lesser extent upon the actual merits of the case.

In conclusion, the questions I have started (as briefly as possible) concern every gas and water company, and call for serious discussion. I trust, Sir, that such discussion will take place in your columns.

A GAS SECRETARY.

Nov. 30, 1897.

P.S.—May I add one word of advice to Directors? It is this: If they should receive a request from the local authority to enter into negotiations for the sale of their undertaking, they should definitely make up their minds whether they will or will not accede to the request; and if the decision is in the negative, then they should, in clear and unmistakable terms, give a simple refusal.

Gas Workers' Superannuation.

SIR,—The establishment of some equitable system to provide for workmen when they are no longer able to work, is a question of growing interest. The State movement in this direction has not advanced beyond the platform stage; and even if completed to-morrow, the most liberal proposals which have yet been discussed are in their nature so modest as to leave plenty of room for local action. I have endeavoured, but without any satisfactory result, to ascertain whether any funds are in existence, in connection with gas-works, for the purpose of providing for old workmen. I should be very pleased to hear from any manager who has such a fund connected with his works; and if he would kindly furnish me with a copy of the rules by which the scheme is governed, he would do me a favour which I should appreciate very highly.

JOHN CARTER.

Lincoln, Dec. 2, 1897.

De-Scurfing Gas-Retorts by Compressed Air.

SIR,—In your issue for Nov. 30 I notice a paper read by Mr. Mellor, at the meeting of the Manchester District Institution of Gas Engineers, entitled "Billington's Patent Method of De-Scurfing Gas-Retorts," which operation is effected by means of a blast of compressed air sent into the retorts. In a portion of a lecture on "Scurfing Gas-Retorts," delivered by me some weeks ago at our City Technical Schools, I brought before my class what I considered to be rather an ingenious, but simple, arrangement for the purpose in question, which I had the pleasure of seeing in operation some years ago where West's compressed-air stoking machinery was adopted. The flexible air-tube, being disconnected from the charger, was coupled on to a wrought-iron pipe about 12 feet long and 1 inch internal diameter; the outer end being brought down to a point forming a nozzle, while at the other end of the pipe, where the operator stood, a cock was fixed for regulating the supply of compressed air to the retorts. The pressure, which was at 60 lbs. per square inch, was allowed to impinge against the accumulated carbon within the retorts; and after a short time the removal of the carbon was easily effected by means of a long rake for withdrawing it.

J. D. ASHWORTH,
Lecturer on Gas Manufacture, City Technical School.

Manchester, Dec. 1, 1897.

The Relation between Water Supply and Enteric Fever.

SIR,—The recent epidemics of enteric fever at Maidstone and Lynn have drawn public attention to the water supplies of this country It may therefore be interesting to your readers to compare the death-rate from fever, for the first three quarters of the current year, in the principal cities of England and Europe, for which official statistics have been published. For the sake of comparison, and to avoid decimals, the

mortality from fever has been computed per million living; but for those who prefer the rate per 1000, it is only necessary to shift the decimal point three places to the left.

Death-Rate from Typhoid Fever per Million Living (1897).

Town.	First Quarter.	Second Quarter.	Third Quarter.	Total for Nine Months.
Belfast	228	392	345	965
Namur	126	92	216	434
Malines	37	92	222	351
Borgerhout	32	—	278	310
Dublin	114	52	124	290
Linz	19	58	213	290
Le Havre	100	84	93	277
Metz	50	83	117	250
Salford	70	79	61	210
Koenigsberg	56	51	97	204
Prag-et-faub.	48	21	133	202
Bruges	22	79	99	200
Blackburn	91	61	46	198
Glasgow	57	69	62	188
Nancy	72	62	52	186
Portsmouth	22	70	93	185
Sheffield	45	17	120	182
Sunderland	77	21	84	182
Norwich	27	9	146	182
Derby	58	10	97	175
Preston	52	26	87	165
Brussels	48	51	62	161
Hull	44	22	93	159
Birkenhead	36	27	90	153
Nottingham	68	30	52	150
Wolverhampton	57	11	80	148
Gateshead	59	40	49	148
Lyons	47	19	81	147
Liverpool	41	32	73	146
Stettin	13	33	95	141
Reims	36	18	83	137
Essen	68	19	49	136
Budapest	64	29	39	132
Gothemburg	70	52	9	131
Burnley	19	37	75	131
Birmingham	45	41	44	130
Halifax	63	21	42	126
Brighton	33	49	41	123
Leicester	63	39	20	122
Anvers	31	18	63	112
Manchester	63	15	32	110
Newcastle	46	36	23	105
Liege	12	24	66	102
Bolton	33	8	58	99
Halle	—	25	74	99
Leeds	26	29	39	94
Dantzig	15	24	55	94
Strasbourg	22	29	36	87
Bradford	30	30	22	82
Oldham	21	34	27	82
London	28	19	32	79
West Ham	18	15	44	77
Leipsic	29	12	36	77
Croydon	17	41	17	75
Louvain	24	—	48	72
Edinburgh	24	24	24	72
Paris	19	21	31	71
Cardiff	18	23	29	70
Rotterdam	14	17	38	69
Cologne	18	18	33	69
Brunn	29	10	30	69
Plymouth	20	10	31	61
Magdebourg	14	18	28	60
Swansea	10	20	30	60
Verviers	19	19	20	58
Brunswick	33	—	25	58
Bristol	13	21	22	56
Munich	—	26	29	55
Barmen	15	15	23	53
Altona	19	13	20	52
Huddersfield	39	—	10	49
Crefeld	—	19	28	47
Copenhagen	12	15	18	45
La Haye	26	16	—	42
Hamburg	4	13	25	42
Stockholm	11	19	11	41
Berlin	7	10	20	37
Frankfort-on-Main	4	4	29	37
Hanover	13	19	5	37
Vienna	7	12	16	35
Lille	13	9	—	27
Dusseldorf	11	5	11	27
Mayence	2	13	13	26
Dresden	5	3	14	22
Breme	14	—	7	21
Charlottenberg	7	—	13	20
Mannheim	10	—	10	20
Amsterdam	—	8	10	18
Nuremburg	—	6	12	18
Chemnitz	6	6	6	18
Stuttgart	—	—	—	—
Seraing	—	—	—	—

It is satisfactory to find that for the 39 weeks ending September, the death-rate from enteric fever in the capitals of Europe has been: Brussels, 161; Budapest, 132; London, 79; Paris, 71; Copenhagen, 45; Berlin, 37; Vienna, 35; Amsterdam, 18. These figures are all low compared with Belfast 965; Dublin, 290; Glasgow, 188; Salford, 210; Namur, 434; Liverpool, 146; Norwich, 182; Bruges, 200; Malines, 351; and Portsmouth, 185.

It will also be noticed that, in the towns which derive their water supply from rivers and which has been efficiently filtered, the mortality from fever is less than from towns obtaining their water from either moorlands or chalk. This shows that proper storage and filtration of river water, and the action of air and light, have a remarkable effect in reducing the risk of fever. For instance, Prague, which is situated on a tributary of the Upper Elbe, and derives its water from cretaceous limestone, had a mortality this year at the rate of 202 per million; while in Altona and Hamburg, where the water is drawn from the Lower Elbe, but only used after passing through sand filters, the death-rate was only 52 and 42 respectively. An examination of the mortality from fever last year among the same towns in England and Europe shows that the same law held good.

Severe epidemics have occurred already at Caterham (twice), Croydon, Chichester, Hants Asylum, Beverley, Wycombe, Portsmouth, Worthing, Newport, Lynn, Maidstone, and other towns, which have been traced to the water in the chalk having been polluted.

We may expect recurring outbreaks of this preventable disease increasing in severity as time goes on, until pressure, measured by votes, has been put upon the Government of the day, to devise means for the better protection of the gathering-grounds and underground springs, from which so large and constantly increasing population derive their domestic supply.

A. H. Smee,
Chief Medical Officer and Deputy-Chairman,
Gresham Life Assurance Society, Limited.

Poultry, E.C., Nov. 24, 1897.

Incorrect Weights and Measures at St. Mary Church.

Sir,—In reference to the paragraph in the "Journal" for Nov. 30, *re* incorrect weights, it was not the weighbridge that was wrong—that was found perfectly correct, and properly stamped—but an old coke scale, which was chiefly used by the hawkers for filling their bags. They were, however, afterwards compelled to go on to the weighbridge before leaving the works; and the weights would generally agree, to within ½ cwt. on the load in favour of the purchaser. The spring-balance had not been used for nine months, and probably would not have been used again. One of the men had left it in the sulphate house, which no doubt caused the spring to get out of order; and it would not be worth repairing. These are the two machines that we were charged with having in our possession unstamped; but why a former Inspector, who tested them and the weighbridge, stamped the latter and not the others, I do not know. The fines were nominal.

T. Evans.

St. Mary Church, Dec. 4, 1897.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Saturday, Dec. 4.

(*Before Mr. Justice* Mathew.)

Bournemouth Gas and Water Company v. Pokesdown Urban District Council.

This was an action set down for trial under Order XIV., in which the plaintiffs claimed £34 19s. for work done, at defendants' request, in lowering certain water-pipes in the Darracott Road, which is within the district of the Council.

Mr. A. Glen appeared for the plaintiffs, and opened the case by citing section 153 of the Public Health Act, 1875, which provides that where any urban authority consider it necessary to raise, lower, or alter the situation of any gas or water pipes, they may require the owners to do this; the expenses of the alteration to be borne by such authority. On Dec. 7, 1896, Mr. Ingamells, the defendants' Surveyor, wrote to Mr. Walker, the Manager of the plaintiff Company, saying they were al ering the level of the Darracott Road, and required the water-pipe to be lowered. Mr. Walker saw Mr. Ingamells, and told him it would be a large job, and they would have to charge for it. Mr. Ingamells said he had not made provision for it in his estimate, and the Company had not charged anything for the last alteration. Subsequently the Surveyor sent a message urging that the work should be carried out at once. It was done, and the amount charged was simply the cost of labour.

Mr. *J. Walker* gave evidence to the above effect. He stated that when the Surveyor remarked that they had not charged for a previous alteration, he told him that if he said any more about it they would charge for it. He did not say any more about it.

Mr. Morten, who appeared for the defendants, submitted that no proper notice was given under the section. It must be a notice requiring the owner of the pipes to do certain specified work, and entitling the urban authority to do it themselves if the notice was not complied with.

Mr. *Ingamells* was called to prove that he told Mr. Walker that the defendants had no money to pay for this alteration, and that he should have to consult his Council about it.

His Lordship decided that the notice was sufficient; and he gave judgment for the plaintiffs, with costs on the County Court scale.

Preference v. Ordinary Shareholders.

In the Chancery Division of the High Court of Justice, Mr. Justice Byrne had before him a few days ago an application, in the voluntary winding up of the Odessa Water-Works Company, to ascertain how the remaining assets, amounting to about £225,000, were to be divided, having regard to the respective claims of the preferred and deferred shareholders. The Company was incorporated in 1872, with a capital of £50,000, in £20 shares. There were issued 30,000 preferred and 12,472 deferred shares; and they were all fully paid up. From time to time a large outlay had to be made for the construction of the works and no dividend was paid on the deferred shares. In 1875, one of 1 pe.

cent. in deferred dividend warrants was paid on the preferred shares; and in 1887, 1889, and 1893, dividends of 1 per cent. in cash were paid on the preferred shares. In 1894, a cash dividend of 1½ per cent. was paid on the same shares. In September, 1895, the Company went into voluntary liquidation in order to sell the concern to the Municipality of Odessa; and from that time till January, 1897, the date of the agreement for sale, the Liquidators carried on the business—the sale being completed in May, 1897. The £225,000 remained after satisfying all the creditors. *Primâ facie*, the whole of this amount was divisible among the shareholders, in return of capital, in proportion to their shares; but the preference shareholders claimed to have certain sums paid to them in respect of dividend before anything was paid on account of capital. The preferential right they possessed was only in respect of dividend, not of capital. His Lordship, in delivering judgment, decided that the claim made by the holders of preference shares failed.

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Saturday, Mr. Justice Romer had before him two actions brought by the Incandescent Gas-Light Company, Limited, against persons named Phillips and Coathupe. The plaintiffs asked for injunctions to restrain the defendants from infringing their patents, and neither of the defendants put in an appearance. The minutes proved the particulars of breaches. Mr. Walter, who appeared for the plaintiffs, stated that the orders proposed were in the same form as those made in actions which had previously been before his Lordship. Mr. Justice Romer said the plaintiffs could take judgment as asked.

A Gas Stoker Fined for Leaving Work without Reasonable Cause.

At the Durham City Police Court last Thursday, Thomas Wilson, lately a stoker in the employ of the Durham Gas Company, was summoned for unlawfully breaking his contract with the Company by leaving their service without reasonable cause, and "depriving the inhabitants of the city of Durham of a proper supply of gas," on Nov. 29. Evidence was given by the Engineer (Mr. E. H. Millard) that defendant was employed as a stoker, subject to fourteen days' notice on either side. He left his employment on the day in question, without giving any notice, and demanded his money. This, however, was refused him; and he thereupon went away. It was also stated that the Company had had a very great deal of trouble with men losing their shifts of work from various causes; and they had had much difficulty in maintaining a supply of gas for the city. Therefore they were compelled to make an example. In answer to the defendant, Mr. Millard said it was quite true that several other men had left, and had not been prosecuted; but they had had excuses. Defendant said he was willing to work out his notice, but denied there was any condition of employment respecting notice. The Bench imposed a fine of 5s. and costs.

Sunday Labour in Gas-Works.

At the Dorking County Court last Wednesday, before his Honour Judge Martineau, the Dorking Gas Company were summoned by a labourer named Underwood for a fortnight's wages in lieu of notice. For the plaintiff it was stated that he was a weekly servant, and he was summarily dismissed because he refused to attend on Sundays to do another man's work. He had not undertaken to do stoking on Sundays; but he had done it several times to oblige his employers. On the present occasion, however, he had refused because of the long hours he had been working. Mr. Down, for the Company, said the men were all engaged on the understanding that, in case of emergency, they would attend on Sundays. If the work in question were not done, the town would be in darkness on Sunday evenings. His Honour said that, according to plaintiff's evidence, Sunday work was a part of his duty; and he gave judgment for the Company.

Electric Lighting Orders (Session 1898).—In addition to the towns named in the "JOURNAL" last week (p. 1184), applications will be made to the Board of Trade next session for powers in regard to the supply of electricity for lighting and other purposes in the following places: Aldrington, Bolton, Burslem, Leatherhead, Margam (Glam.), Nuneaton, Poplar, Shrewsbury, Stoke-upon-Trent, Whitechapel, and Willesden.

Longton Gas-Works Extensions.—At the meeting of the Longton Town Council last Thursday, the Gas Committee recommended the acceptance of contracts for the construction of a new retort-house and a steel roof thereto, and for the supply of exhausting plant, charging and drawing machinery, &c., and the erection of a retort-bench, regenerator furnaces, &c. They further proposed that application be made to the Local Government Board for power to borrow £20,000 for gas-works extensions. The recommendations were confirmed.

The Proposed Gas-Works Loan for Wigan.—At the meeting of the Wigan County Borough Council last Wednesday, the Chairman of the Gas and Electric Lighting Committee (Alderman Holmes, J.P.) gave, at the request of Mr. Worthington, some particulars as to the loan of £20,000 for which, as mentioned in the "JOURNAL" last week, application is to be made to Parliament. He stated that the Gas Engineer's report covered a period to extend at least over three years, and the amount was £12,756. This included £3200 for mechanical stokers, if, in the opinion of the Committee, such a thing might become necessary. The other particulars included a lamp-store and repairing rooms, £650; two new purifiers, £1000; laboratory and photometer room, £80; new mains, £2500; new services, £1800; new meters, £2000. Adding 10 per cent. for contingencies, the total amount was, as already stated, £12,756. It was considered necessary that they should make application for £20,000. In 1891, the Council obtained power to borrow £35,000, covering an expenditure of some £5000 which had been incurred prior to the sanction being given. This money had not been spent, as it was ear-marked, and set aside for a special purpose.

MISCELLANEOUS NEWS.

THE DISPUTE IN THE ENGINEERING TRADE.

The Masters' Proposals.

It will be seen from our editorial columns that the conference on the dispute in the engineering trade has been adjourned till next Tuesday, in order to allow of the submission of the proposals made by the representatives of the Employers' Federation to the members of the associated Trade Unions on the other side. These proposals are as follows:—

I.—*Freedom of Employment.*

Every workman shall be free to belong to a Trade Union or not, as he may think fit.

Every employer shall be free to employ any man, whether he belong or not to a Trade Union.

Every workmen shall undertake to work peaceably and harmoniously with all fellow-employees, whether he or they belong to a Trade Union or not.

II.—*Piecework.*

The right to work piecework at present exercised by many of the Federated Employers shall be extended to all members of the Federation and to all their workmen.

The prices to be paid for piecework shall be fixed by mutual arrangement between the employer and the workman who is to do the work.

The Federation will not countenance any piecework conditions which will not allow an efficient workman to earn at least the wage at which he is rated.

The Federation recommend that all wages and balances shall be paid through the office.

III.—*Overtime.*

[Terms of recommendation agreed to be made to employers.]

When overtime is necessary, the Federated Employers recommend the following as a basis and guide:

That no man shall be required to work more than 40 hours overtime in any four weeks after full shop hours have been worked.

In the following cases overtime is not to be restricted: Breakdowns in plant; general repairs, including ships; repair or replace work, whether for the employer or his customers; trial trips.

No alteration, restriction, or extension of this basis shall be made except by mutual agreement between the employer and the individual workman concerned.

This basis is to apply only to members of the Trade Unions who are represented at this conference.

All existing restrictions as regards overtime are to be removed.

IV.—*Rating of Workmen according to Ability.*

Every workman shall be paid according to his ability; and no employer shall be restricted in employing any workman at any rate of wages mutually satisfactory to them.

Note.—It must be distinctly understood that by the foregoing there is no intention whatever to reduce the rate of wages paid to efficient workmen.

The following are some illustrations of the necessity for employers having the freedom above referred to: In most works there are old servants—men up in years, or men whose efficiency is impaired by partial disablement or indifferent health—who are not able to earn the same wages as younger and stronger men. There are also men who, although they may have had a mechanical training, are not, from various circumstances, worth as high a rate of wages as other more able men, but still all these classes of workmen may be worth a lesser rate of wages. The employers must have the option of engaging or retaining these or other men at such rates of wages as are mutually satisfactory, rather than refuse them employment on work on which they could be advantageously employed.

V.—*Apprentices.*

There shall be no limitation of the number of apprentices.

VI.—*Selection, Training, and Employment of Operatives.*

The machine tools are the property of the employers, and they are responsible for the work turned out by them. They, therefore, will continue to exercise their discretion to appoint the men they consider suitable to work them, and determine the conditions under which such machine tools shall be worked. The employers consider it their duty to encourage ability wherever they find it, and shall have the right to select, train, and employ those whom they consider best adapted to the various operations carried on in their workshops, and will pay them according to their ability as workmen.

THE PROPOSED EXTENSION OF THE DUNDEE CORPORATION GAS-WORKS.

Report by Mr. W. M'Crae.

The following are the principal portions of a report recently presented to the Gas Committee of the Dundee Corporation by the Engineer and Manager (Mr. W. M'Crae) on the proposed extension of the gas-works. As mentioned in our "Notes from Scotland" last week, it was considered by the Committee on the 22nd ult., and was ordered to be submitted, with the plans, to Mr. W. Foulis, of Glasgow, for revisal and adjustment.

Perhaps it is not generally known that carburetted water gas has for years been gradually becoming adopted in this country to take the place of, or to be used along with, coal gas, until now it is recognized by the most eminent gas engineers to be an economical as well as a safe means of producing gas of almost any desired illuminating power. It has been in operation in a large number of gas-works for a considerable time, among them being the following: Manchester, Coventry, Brighton, Swansea, Liverpool, Southport, The Gaslight and Coke Company, Belfast, Stockport, Tottenham, Norwich, Preston, Bath, Winchester, &c. It has also

been erected in Edinburgh, where it will be in operation in a few weeks; and from particulars I have recently received from several of these towns, it has proved an unqualified success, financially as well as practically, and no effects injurious to health have been produced by its adoption. The maximum daily production of the carburetted water-gas plants in the various works ranges from over 20,000,000 down to about 150,000 cubic feet. . . . One great advantage of the carburetted water-gas system is the rapidity with which it can be heated up and brought into operation. It can be made ready for working at full capacity within four hours of the time of first lighting; whereas from three to four days are required to heat up a retort-bench to produce coal gas. In a manufacturing city like Dundee, the advantages of such a system cannot be over-estimated, as during dull and foggy weather the demand for gas becomes suddenly increased to such an extent that more producing power is urgently required; and no apparatus has as yet been invented that can be brought into operation so speedily, or can be held in readiness so economically, as the above system. Having regard to the success which has attended the introduction of this system, and the absence of results injurious to health in the above-mentioned towns, I think you would be warranted in introducing a plant capable of producing 2 million cubic feet of gas a day, together with a tank capable of containing about 3400 tons of oil, which is the average cargo of tank steamers. The oil is shipped in America, and on arrival here would be conveyed direct from the vessel into the store-tank in the gas-works by a pipe which would be laid for the purpose between the docks and the tank. By the adoption of this plant, the number of coal-gas retorts required is greatly reduced; and I have based my calculations in this direction on the understanding that the average mixture of the two gases is at the rate of 1 of water gas to 2 of coal gas.

At present there are in your works two benches containing together 240 retorts, all heated on the regenerative principle; but as one of these benches requires to be rebuilt next summer, I propose to increase its size by the addition of 32 retorts – being 272 in all. The present retort-house is rather too narrow, and much too low, to admit of the adoption of charging and drawing machinery; it would therefore require to be reconstructed and enlarged, and two new chimneys erected in place of the round and square ones at present serving these benches. A new retort-house and bench would also require to be erected alongside the present one. This can only be done after removing the north-east gasholder; and before it could be taken away, the present largest one must be increased in size. All these retorts, I would suggest, should be manipulated by mechanical appliances, such as stoking and drawing machines, coal breakers and elevators, overhead coal-hopper, and circular railway on the floor level. The three benches would be capable of producing together about 3 million cubic feet of gas daily; and by the addition of water gas in the proportion named, the total daily production would amount to about 4½ million cubic feet. Should the maximum daily consumption continue to increase at a similar rate as in former years, no further addition would be required here for about ten years.

The present station meters are too small to correctly register the amount of gas required during the winter months. I would therefore suggest the erection of a new one, capable of passing 150,000 cubic feet of gas per hour. A house would require to be erected to accommodate this meter, with space left for another of the same size; but there is sufficient ground for this purpose behind the exhauster-house. Meters are required to measure the carburetted water gas, in order to have the proper percentage of the different gases; and the existing meters would do well for this purpose if they were removed to another site.

I would suggest that two additional lifts be added to the largest gasholder, the present cast-iron columns to be replaced by steel standards 125 feet high; thereby almost doubling the capacity of the holder. The present gasholder could be enlarged in about six months; while about two years would be required to construct the new holder. By increasing the capacity of the largest holder, and removing the north-east one, the storage capacity would be increased only about 400,000 cubic feet. It would therefore be necessary to erect another large holder on the site of the present north-west one; but no further extension of holders, except in Lochee, would be required for more than twenty years. The present station governors are of an antiquated design, and quite worn out; I would therefore suggest the erection of three new ones, together with a house to contain them, which can be built to the east of the office.

I would suggest that the east condensers should be removed to a new site, and the north portion of the east retort-house, and the bench therein, with the chimney, taken away; thereby giving storage accommodation for about 8000 tons of coal. Sidings would require to be laid down here for the stacking of the coal, and a circular railway constructed, so that the coal would be emptied direct from the waggons into the coal-breakers—the empty waggons being passed forward without the necessity for shunting. This method of dealing with the coal does away with the double handling, as carried on at present—viz., emptying the waggons on the floor of the shed, and thereafter conveying the coal to the retorts in bogies—but it also means that, in order to get the best results in working, sidings must be provided to accommodate waggons containing a sufficient quantity of coal to serve the retorts from Saturday forenoon until Monday forenoon. The quantity of coal required during this period for 352 retorts would amount to about 650 tons, and some 90 waggons would be required to convey it to the breakers. This means that sufficient ground upon which to lay down these sidings should be acquired, which would amount to about 150 poles, and would form a strip of ground running north and south alongside the eastern boundary of the works.

If all the gas required by the city were produced from coal, the alterations and additions already mentioned would all need to be given effect to, excepting, of course, the carburetted water-gas plant; but the following additions would also have to be made: A new retort-bench, containing 192 retorts, would require to be erected in the new retort-house, which would be manipulated by mechanical appliances, as already suggested. This bench will cost a large sum, as all the foundations for it must be built upon the bottom of the gasholder tank, which is 25 feet below the ground level. A new scrubber or ammonia purifying-machine would be required, and extra siding accommodation provided, as more waggons would be needed to carry sufficient coal to serve the greater number of retorts during the period before mentioned. It would also be advisable to take in additional ground upon which to store more coal, in order to safeguard the lighting of the city during any strike, colliery breakdown, or other unforeseen occurrence. The maximum daily production of both the systems herein detailed amounts to 4½ million cubic feet. In neither of these systems have I taken into account the high-level railway, as I do not see how the saving to be effected by its adoption could amount to such a sum as would warrant the large expenditure involved in its construction. I would recommend that, irrespective of which system is adopted, a locomotive engine be procured to take to and from the works the full and empty waggons. By so doing, there would be a considerable yearly saving compared with the present horse haulage.

The following is the approximate cost of the alterations and extensions; those of the coal-gas department being designed on the lines indicated by Mr. Foulis, with the addition of a carburetted water-gas plant. Whatever extensions are decided upon should be proceeded with at once; and from three to four years would be required in which to complete them:—

Alterations and extensions in order to supply a mixture of water and coal gas	£75,000
Alterations and extensions in order to supply coal gas only	71,050

Might I suggest, in conclusion, that should you wish to modify the extensions and alterations, and thereby reduce the expenditure, or spread it over a more lengthened period, you could do so in the following manner: Introduce a carburetted water-gas plant, increase the size of the largest gasholder, reconstruct the present east section retort-house, and extend the bench therein—all as already pointed out; but instead of at present building a new retort-house and bench in the east section, you could, when required, use one of the benches in the west section retort-house. There would then be 272 retorts manipulated by mechanical appliances, and the others by manual labour as at present. The expenditure by this modified plan would be as follows:—

1.—Re-erecting retort-houses, enlarging gasholder, erecting carburetted water-gas plant, meter-house and meter, mechanical stokers, new governors and governor-house, and railway sidings	£35,150
2.—Five years hence, new gasholder	30,000
3.—In about eight years you will require to erect a new retort-house and bench on the site of north-east gasholder, the cost of which would be, together with mechanical appliances for manipulating the retorts	9,850
Making a total of	£75,000

In order that whatever alterations or extensions you may decide upon may be carried out expeditiously and in good time for next winter's requirements, I would impress upon you the necessity for these being put in hand without delay.

THE PROPOSED ISSUE OF NEW STOCK BY THE WATERFORD GAS COMPANY.

In noticing last week the intended applications to Parliament for additional powers in connection with gas undertakings, we mentioned that the Waterford Gas Company purpose applying for authority to issue new stock, which will be offered in the first instance at par to the consumers. We learn from a print of the Bill to be introduced that the stock will be allotted in the following proportions: Where the payment for gas used during the last preceding year amounts to less than £5, the consumer is to be entitled to an allotment of not exceeding £20 of stock; where it amounts to £5 and less than £10, £40 of stock; £10 and less than £15, £60 of stock; £15 and less than £20, £80 of stock; £20 and less than £25, £90 of stock; and above £25, £100 of stock. No consumer is to be entitled to an allotment of less than £10 or more than £100 of stock; and no stock issued to a consumer is to be sold by him to any person who is not at the time of the sale also a consumer. Stock not disposed of in the above-named manner is to be offered for sale by auction or tender; but where the amount bidden or tendered by any proprietor is equal to the highest sum named by a non-proprietor, the former is to be declared the purchaser. Any stock not sold by auction is to be offered, at the reserve price put upon it for the purpose of sale, to the holders of ordinary stock, as provided by the Companies Clauses Act, 1863; and in the event of their not taking it, it is to be again put up to auction or tender, but at a lower reserve price. If not then sold, it is to be offered once more to the proprietors at the lower figure.

THE YEOVIL CORPORATION AND THE GAS-WORKS.

The Yeovil Corporation having decided to apply to Parliament for power to purchase the undertaking of the Yeovil Gas Company, a meeting of the burgesses was recently held in the Town Hall, under the presidency of the Mayor (Alderman Tompkins), to consider a resolution authorizing the Town Council to promote the necessary Bill. The Mayor, in opening the proceedings, remarked that, though the Gas Company had been established upwards of 64 years, the Directors had never till now gone to Parliament for statutory powers; and, in the interests of the ratepayers and gas consumers, the Town Council had considered it their duty to apply for an Act for the purchase of the gas-works. They had appointed a deputation to meet the Directors, and had offered £48,000 for the purchase of the works; but the Directors had refused to sell. The Council were willing to come to a compromise; and if the Company would drop their Bill the Corporation would drop theirs. The Mayor then proposed a resolution to the effect that power be given to the Council to proceed with their Bill in Parliament. Mr. F. Raymond, in seconding the motion, said he was sorry to have to disagree with the Mayor on one point. They could not entertain any idea of compromise; their Bill would have to be pushed forward. The Council had proposed a resolution that they would oppose the Gas Company's Bill, and also that the gas-works should be in the hands of the Corporation. While the market price of the Company's shares was only £22 10s. each, the Corporation had offered to purchase at the rate of £24. The speaker proceeded to quote the prices of gas stocks throughout the country, with

the object of showing that gas undertakings were profitable investments. Mr. E. L. Whitley (the Chairman of the Company) said the Directors considered they had never been approached in a fair spirit by the Council. It would not rest with the present meeting as to whether the Corporation bought the gas-works. About 25 years ago the Corporation spent £25,000 on water-works, and now they would have to spend another £10,000 or £12,000. If they purchased the gas-works, they would find, in course of time, that they would have to renew their plant; and he considered if they borrowed the money to be repaid in fifty years, with the loan and sinking fund, it would amount to £4 1s. 6d. per cent. Mr. Pittard said it was true the water-works cost £25,000, and he was glad Mr. Whitley had placed this before them as an object-lesson. The revenue from the water-works now, after allowing for the loss on the public baths, paying income-tax, rates, renewals of pipes, meters, &c., was £2144 14s. 1d. The Corporation knew what they were about when they decided to purchase the gas-works. The entire receipts for water last year were £3106 14s. 5d.; and by the profits realized the Corporation had been enabled to lower the rates by upwards of £1100. Mr. C. J. Hook opposed the motion. He considered it would cost £1200 or £1500 to promote the Bill, and they were not sure that it would pass. He reckoned that to borrow £50,000 for thirty years would entail an annual payment of £2550. As the present profits of the Company were only £2200, it would mean £300 per annum for the ratepayers to make up. Electricity had made rapid strides during the last few years; and who could tell that a new illuminant would not take the place of gas in the near future? They could oppose the Company's Bill without purchasing the gas-works. He was about to propose an amendment to this effect; but the Town Clerk said it could not be received. On being put to the meeting, the motion was carried by a large majority.

ELECTRIC LIGHTING NOTES.

Mitchelstown (which gained such unenviable notoriety some years ago) is going in for electric lighting works, to carry out which a loan of £900 has been applied for by the Board of Guardians. It is an interesting scheme from the fact that this is the first poor-law corporation—anyway in Ireland—to adopt the provisions of the Electric Lighting Acts.

Last Tuesday night there was a repetition of the partial breakdown of the electric light street service in some important quarters of Dublin. The lamps were out for a considerable period on the west side of Grafton Street, the north side of Dame Street, and the east side of Capel Street. Fortunately, the lamps on the opposite sides of these thoroughfares were alight; and thus complete darkness was prevented. As it was, the particular places affected presented a most gloomy and dismal aspect.

A Canadian correspondent of the "Financial News" states that active negotiations are proceeding between a group of capitalists at Toronto and the conductors of a large number of electrical and gas lighting undertakings throughout the Dominion of Canada, but especially in the province of Ontario, with the idea of amalgamating all these different enterprises under one management, and thereby effecting considerable economies in the cost of administration. The Syndicate formed is stated not to contemplate purchase outright in every case, but simply the acquisition of a sufficient control to direct the policy of the various concerns in accordance with the ideas of the central organization. The correspondent in question states that an idea prevails that the whole enterprise will ultimately be offered to English investors; but he has been unable to obtain any definite confirmation of this.

When referring last week to the proceedings at a recent meeting of the Hastings Town Council, at which the Lighting Committee reported that they had authorized the Town Clerk to give the requisite parliamentary notice of the intention of the Corporation to apply to the Board of Trade for a Provisional Order to sanction the purchase of the Electric Light Company's undertaking, we recorded the fact that some of the members protested against this action, and we remarked that this demonstration of feeling seemed to indicate that the Council are not now altogether satisfied with their bargain. This conclusion seems to be justified by what has since appeared in one of the local papers. Only five members voted for the adoption of the Committee's report; and it is quite evident that several of the new Council would be glad to frustrate the completion of the purchase—mainly on the score of the price to be paid for what is regarded in certain quarters as possibly obsolete plant. It is confidently asserted that, if the burgesses were polled on the subject, there would be an overwhelming majority in opposition to closing the bargain on the present lines; and the new Corporation have been publicly challenged to make the experiment. The ratepayers are quite willing that the Corporation should take up their own electric lighting; but they very strongly and very reasonably object to being compelled, by the action of their representatives, to buy what many of them look upon as "a pig in a poke."

The Llandudno District Council have in hand a scheme for the erection of electric-lighting works and the provision of a refuse destructor; and for these purposes, they require £25,000. Having made application to the Local Government Board for sanction to borrow this amount, an inquiry was held last Tuesday by Mr. F. H. Tulloch, to whom the scheme was explained by Mr. A. H. Preece and Mr. E. P. Stephenson, the Engineer to the Council. It appears from their statements that the central station is to be situated in the neighbourhood of the gas-works; and that the principal portions of the plant will consist of two engines and dynamos of 250 horse power each, and a large reserve battery, sufficient to supply the requirements of the town in case of any failure in the ordinary plant. The three-wire system is to be adopted; and it is proposed to place thirty arc lamps on the promenade, and twenty others in the main streets. Now comes the interesting point. Of the sum to be borrowed, the electric lighting portion of the scheme is to cost only £15,300, and £1000 is to be allowed for contingencies; while the whole of the balance of the £25,000, except £109—that is to say, £8591—is to be spent on the refuse destructor part of the scheme, which will only deal with about 15 tons of refuse in twenty-four hours out of a total supply of something like 30 tons. There was no opposition to the scheme; but the Inspector was asked to do his best to hasten the decision of the Board, so that, if favourable, work could be proceeded with during the winter.

The troublesome question of the electric lighting of Dublin was under the consideration of a Committee of the whole Corporation on Monday last week. Professor Kennedy was in attendance; and one of the important matters discussed was that of the site for the new central station. It is understood that the Professor has modified his view as to the unsuitability of the Pigeon House Fort as the central station, and is now of opinion that, taking all the circumstances into account, and especially the cost of a station elsewhere, he thinks the Pigeon House may be advantageously selected. The result will be reported to the Council. Another item which occupied attention was a proposition by the United Tramways Company to carry out the electric lighting of the city under certain conditions. The Company are, it appears, considering the desirability of erecting a large central station for the purpose of supplying electric current to the tramways. They believe that an opportunity has arisen which would enable them, with some profit to themselves, to give the public almost immediate advantages both in regard to the cost of electric lighting and to the extent of the area of supply. The Directors therefore propose that the Corporation should transfer their Order to the Company, together with the buildings, plant, &c., used in the lighting of the city. On their part, the Company are prepared to undertake to pay the annual instalments of interest and sinking fund, or to pay off the debt at their own option; to provide the necessary cables and plant with all possible speed for supplying the existing demand for private and public lighting; to reduce the price of current from 7d. per unit to 6d. and 4d. respectively for private and public lighting six months after the transfer of the Order; and when the new station is in working order (or within two years) to further reduce the charge to 5d. and 3d. respectively. After the letter had been read, the Committee decided that they had not power to entertain the proposal at that meeting.

PROJECTED LARGE ELECTRICITY SUPPLY SCHEMES FOR THE MIDLANDS.

The sanction of Parliament will be sought next session for a large scheme of electricity supply which has been projected by the General Power Distribution Company. It is proposed to construct at Warsop, near Mansfield, a central station at which electricity will be generated and conveyed to distributing stations, whence it will be supplied by underground cables all over the district intended to be served by the Company. The extent of this will be appreciated when it is stated that it is to include all places within a radius of 25 miles from the Parish Church of Warsop. It will consequently take in Sheffield, Rotherham, Retford, Gainsborough, Lincoln, Newark, Mansfield, Nottingham, Long Eaton, Derby, Ilkeston, Chesterfield, Worksop, and all the intermediate towns and villages. The promoters, however, do not seek to interfere in any way with existing bodies, but will be willing to supply them wholesale (at a less price, they are confident, than it can be produced locally) with electric energy, and leave them to distribute it among their customers. The reason for selecting Warsop as the centre of operations is the fact that it is situated in the midst of the colliery district; and the basis of the scheme is the utilization of the now comparatively worthless slack from the mines in the generation of the current. The promoters indulge the hope that the energy thus produced will be so cheap that many establishments at present having private electric installations will be glad to hire motors from the Company, and use their current for driving machinery. They state that their price will be insignificant as compared with that now charged in England; and, of course, the current will be available for lighting, heating, or the production of motive power. The promoters include several influential coalowners and some well-known capitalists, who, in this enterprise, are associated with the Thompson-Houston Company, the representatives in England of the General Electric Corporation of the United States. The scheme is an important one; and its progress will necessarily be watched with much interest. It appears that it was submitted to the Board of Trade, the officials of which considered the proportions of the project too large and important to warrant them in sanctioning it by a Provisional Order; but they expressed the opinion that it thoroughly deserved the attention of Parliament, and it has their approval.

Parliamentary authority will also be sought next session for a similar scheme for the Black Country. A Company was registered a short time ago, under the title of the Midland Electric Corporation for Power Distribution, Limited, with a capital of £200,000; and the promoters are being advised by Mr. G. L. Addenbrooke, of London and Wolverhampton. It occurred to this gentleman that the industrial centres of South Staffordshire, especially those lying between Birmingham and Wolverhampton and between Walsall and Dudley, would form an admirable area in which electricity could be generated at one or more central stations, and supplied for use in the various hardware industries. It was recognized that one obvious advantage would be the proximity of coal, and the cheap rate at which large quantities of slack could be obtained. Automatic stoking and labour-saving contrivances for the easy supply of fuel to the furnaces were also important factors in the calculation. The idea is to erect at a convenient centre boilers and engines to the extent of from 6000 to 10,000 horse power, and to operate in a district lying within a radius of about six miles. The promoters are of opinion that they will be in a position to supply power at rates not much higher than those prevailing in the area of the Niagara electric supply, and very much lower than would be involved by the separate generation of electricity at individual works. The area scheduled in the Company's application for a Provisional Order (for this scheme is not, like the one mentioned above, too large for the consideration of the Board of Trade) includes several towns, some of which already have municipal electric lighting installations; and in these and other cases the promoters are, it is stated, negotiating as to terms. The Directors believe they will be able to offer advantages which will secure the goodwill of the various towns. The Company wish for power not only to supply electrical energy for mechanical and lighting purposes, but to let to their customers the necessary motors for their machinery, so that those who wish to avail themselves of electric power may do so without any large expenditure of capital. One of the main ideas of the promoters is that the machinery requisite to produce the power provided in the day hours would be sufficient to meet any possible demand for lighting.

METROPOLITAN WATER SUPPLY COMMISSION.

The second sitting of the Metropolitan Water Supply Commission was held yesterday. Lord Llandaff presided; and all the members were present. The Chairman, at the commencement of the proceedings, said that, before taking evidence, he thought it would be convenient if he indicated the course that the Commission intended to follow. They had decided not to re-open the questions reported upon by the Royal Commission presided over by Lord Balfour; and, generally speaking, they accepted the findings of that Commission. Mr. H. L. Cripps, the Parliamentary Agent to the London County Council, was then further examined by the Chairman; his evidence being directed to showing that it had been the policy of Parliament, in the cases of some of the Companies at least, to authorize competition in various districts of London, in order to secure to the consumers the advantages of cheaper rates and the better supply which usually followed from competition. He could not, however, mention any case since 1847, in which Parliament had created a fresh supply in competition with an existing supply, though there were even now cases in which, in the same street, two Companies had sets of mains. A fuller report of the proceedings will be published next week.

HEYWOOD CORPORATION WATER SUPPLY.

The Projected Reservoir at Ashworth Moor.

The notices of intended applications to Parliament next session for powers in regard to gas and water supply which appeared in the "JOURNAL" last week, included one given by the Heywood Corporation for an extension of time for carrying out certain water-works. The principal feature of the scheme is the construction of a reservoir at Ashworth Moor. This idea is not a new one. So far back as 1877, in a Bill which was promoted for the purpose of obtaining a reduction in the supply of compensation water at Naden Brook, and also to secure the right to take and use the water from about 580 acres of land situated on Ashworth Moor, this power was obtained by the Heywood Water Company, the predecessors of the Corporation. The water is to be collected, by means of a catchment drain about 1¼ miles long, into a large reservoir to be constructed on land secured by the Corporation on the southerly side of the road leading from Rochdale to Edenfield, at a point where the township of Norden joins that of Bamford. The area of the water supply of the Corporation includes not only the borough of Heywood, but also that of Middleton, the districts of the Urban District Council of Norden, and portions of those of the Urban District Councils of Castleton and Chadderton, as well as parts of the townships of Birtle-cum-Bamford and Pilsworth. Naturally with such a wide area to serve, and remembering the number of new buildings which have been put up in the Castleton and Middleton districts, it was to be expected that the demand for water would augment steadily. Of late years there has been a very rapid increase. In 1889, when the works in connection with the Naden middle reservoir were completed, the population supplied with water by the Heywood Corporation numbered only about 47,000 persons. Now, however, the population is something like 60,000, or an increase of 13,000 people in eight years. This rapid growth renders it absolutely necessary that further provision should be made, and that works for providing additional storage should be commenced. Taking these facts into consideration, it is locally considered that the Council have acted wisely in securing the whole of the lands and easements necessary for the suggested works. The Ashworth Moor scheme is regarded as being an economical one. The reservoir is to have a holding capacity of nearly 150 million gallons; and there is a very favourable site for the construction of the necessary embankment. Upon the site and on adjacent lands belonging to the Corporation there is an ample quantity of stone and clay for the construction of the work; and, so far as can be ascertained by boring operations, the Engineer (Mr. J. Diggle, Assoc.M.Inst.C.E.) has every reason to believe that the spot is a most favourable one for the construction of a reservoir. The average depth will be about 24 feet; but in the deepest part it will be about 49 feet. The top-water level of the reservoir when full will be nearly 80 feet higher than that of the highest existing reservoir in the Naden Valley; and therefore all the old reservoirs of the Corporation will be, so to speak, under the control of the new reservoir as regards level. At present the highway from Ashworth Moor to Ashworth passes through the centre of the site; but power will be sought to stop this road, and construct a new one 15 feet wide over the top of the proposed embankment. This, it is believed, will be a far more satisfactory road than the present one.

THE WATER QUESTION AT TODMORDEN.

The perusal of what has lately appeared in the "JOURNAL" in regard to the above subject, followed by a glance at the parliamentary notices contained in the last issue, will have furnished a pretty clear indication to those of our readers who are interested in water questions that one of the tussles of the coming session will probably be over the water supply of Todmorden. At present this is in the hands of a Company; but their undertaking is coveted by two Local Authorities—the Todmorden Corporation on the one hand, and the Rochdale Corporation on the other—both of whom will promote Bills to enable them to acquire it. As soon as the Rochdale Corporation gave notice of their Bill, the Todmorden people decided to oppose it, and promote a Purchase Bill themselves. At the last moment, however, an alternative scheme was submitted to them; and greatly to the surprise of many of the members, notice of two Bills has been given. Under the new scheme, the Todmorden Corporation will leave to Rochdale the reservoir in Ramsden Clough and the gathering-ground there and at White Slack—sufficient for a second reservoir below the present one; and will themselves acquire sites for reservoirs at Gorpley, with the excellent gathering-ground at that place, and rely upon this as their source of supply. As a necessary part of the scheme, they seek compulsory power to acquire the mains and pipes in Todmorden belonging to the Company. It appears that this scheme is just now in great favour at Todmorden, especially among the members of the Corporation. It is admitted that the purchase of the whole undertaking of the Company would increase the rates by about 8d. in the pound, and the idea prevails that water could be obtained cheaper from Gorpley. This, however, is by no means certain. It is estimated that the works at Gorpley would cost £50,000; and before they could be of any use, the pipes now belonging to the Company and running through all the streets in the town would have to be bought. As these represent the whole value of the Company's present and future business in Todmorden, the price would necessarily not be small. If the first Bill of which notice was given were to pass, the purchase of the Company's works by Rochdale would be prohibited; but if the second were to receive the sanction of Parliament, the provisional agreement entered into between the Rochdale Corporation and the Company would be void. In Rochdale, the general opinion seems to be that neither of these eventualities will come about, and that authority to purchase the Company's works will be granted to the Corporation of that borough, who had the right to supply Walsden and part of Todmorden for many years before the Company was formed, and have never relinquished it. On the other hand, the Corporation of Todmorden claim that they alone should have the privilege of acquiring the Company's works. This is the issue which will be submitted to Parliament for settlement. It seems that a local resident has suggested a scheme whereby Rochdale would take over the whole of the Company's works for six years, and supply Todmorden during that period. By the end of the term, Todmorden would have their own reservoirs at Gorpley. They would then buy from Rochdale the service-pipes, and thereafter supply themselves; leaving for Rochdale the Ramsden Clough works, and the adjacent gathering-grounds.

At a meeting, composed of about forty gentlemen, held at the Conservative Club, Rochdale, last Tuesday, Mr. Sharp delivered a long address on the subject of the water supply of the borough. He said that in view of their present limited sources of water, the Water Committee had consulted Mr. Mansergh, who had advised them that unless steps were taken immediately to obtain an additional supply, the householders and traders of the district would, with the present rate of increase in the population and an ordinarily dry season, be inconvenienced owing to scarcity of water, and that to be safe the additional supply must be provided by the year 1900. This opinion only confirmed reports made by former Engineers—notably Mr. Hawksley and Mr. Rofe. After fully considering the position, the Committee looked around to find suitable sources of supply; and they ascertained that there were only the hills between Littleborough and Todmorden to which they could look with the hope of being successful. The Committee visited the works of the Todmorden Water Company, and had come to the almost unanimous conclusion that they were the works for Rochdale. Inquiries were made, and it was found that the Company were prepared to negotiate with the Corporation for the sale of their property. After obtaining particulars, the Water Committee were advised that the best interests of the town would be served if satisfactory terms could be made with the Company by which the whole of the watershed could be secured to the Corporation. He then explained in detail the terms of purchase, and said that for the money paid the Corporation would get a reservoir capable ultimately of earning £6300 a year, and that when they had sold the water there would be an annual profit of £1000 on the working. He went on to give a forecast of the estimated deficiency on the Todmorden works, according to the terms of purchase, and the present works, and showed that by 1905 the Corporation would begin to reduce the rates in Rochdale with the increased revenue that was sure to be derived from the various water-works. In conclusion, he said the matter rested with the people, who he sincerely trusted would decide to acquire the Todmorden works. He meant to fight for the scheme to the last, and not let other towns be in a superior position to Rochdale. Mr. Sharp was questioned on various points, and then Mr. Johnson spoke against the proposal. He said the whole scheme looked anything but straightforward and above-board. It seemed to him that the Rochdale Corporation were just the "eggers on" of the Water Company for the purpose of compelling Todmorden to buy the works. He asked Mr. Sharp if he could point to any corporation in England who had parliamentary power to take water already impounded and flowing into one corporation's territory to supply another corporation, and to make the former subservient to the town taking the water? It was ridiculous to any man who had the least experience of the practice of Parliament to suppose that if Todmorden were to ask for the water-works Rochdale would have the ghost of a chance of getting them. He was certain it would not be ten minutes before the Rochdale Corporation would be ousted; and the ratepayers would have to bear the expense. Other gentlemen having spoken, Mr. Sharp replied to the various objections raised. He asserted, with reference to Mr. Johnson's remarks, that the scheme had been promoted in a manner that was perfectly fair and straightforward; and that in purchasing the Todmorden works Rochdale desired not only to take over them, but to secure the gathering-grounds in the vicinity. No resolution was passed.

A Large New York Gas Company.—A certificate of incorporation of the New Amsterdam Gas Company, of New York City, has been filed with the Secretary of State. The capital stock is $23,000,000, $10,000,000 of which is preferred, and $13,000,000 ordinary. The Company will carry on their operations in the city and county of New York; and in addition to manufacturing and supplying gas for lighting, they will produce and sell electricity for illuminating, heating, and power purposes.

The Corporation of London and the Metropolitan Water Inquiry.—At the meeting of the Court of Common Council of the City of London last Thursday, the County Purposes Committee brought up a report recommending that they should be authorized to take such steps as they might deem expedient to place the views of the Corporation of London before the Royal Commission on the Water Supply of the Metropolis. It was stated that the financial considerations involved in the matter seriously affected the City, which paid one-eighth of the entire rates of the Metropolis, and would therefore have to bear an eighth share of any outlay incident to the purchase of the interests of the Water Companies. The report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners had a busy day last Monday. They first had a dissent by Mr. Waterston against the proposed new site for the gas-works at Granton. This was brought up on the minutes. It is rather disappointing, when the Commissioners unanimously agreed to the scheme, to find that one who was absent when they arrived at that decision should come forward at the first opportunity with a dissent. The first thought which rises to my mind is that, if the Gas Commission business was so important that it requires to be dissented from, it surely would have been worth Mr. Waterston's dispensing with the matters which kept him away, and to have attended the meeting; but, seeing he did not do so, he might now have held his tongue. It is not transacting the business of the Commission to stay away from the meetings of the body, and then to come up and dissent from what his colleagues have done. If it were not for the gravity of the assumption, I should almost feel inclined to look upon Mr. Waterston as having dissented with a view to standing well with democratic supporters. But then I consider that, when a Commissioner is appointed, he takes a formal obligation to do his best for the Commission; and I find difficulty in coming to such a conclusion. I am inclined to think Mr. Waterston's wrong move on this occasion was due to mistaken judgment, or, seeing he was not at the previous meeting, to lack of information, which would be another reason for his making not merely an endeavour, but even a sacrifice if that were necessary, in order to be present when important business is being taken up. Mr. Waterston was not allowed to proceed to give his reasons of dissent, for the standing orders were involved; and these provide that reasons of dissent must be given in, in writing, afterwards. He had, however, got the length of saying that the area was far too large, and the period mentioned excessive, especially when they considered that they had considerable vacant ground at Portobello and Leith. I am not going to follow him into this; I will simply say that it was a begging of the whole question. Mr. Waterston is not a land valuator, nor an appraiser; and he may be sure that the subject has not been considered without the aid and advice of those who are.

The Commissioners had before them a report by the Works Committee, which stated that they previously resolved that, "in view of the Convener's favourable report of his interview with the Board of Trade as to reclamation of the foreshore and erection of a jetty at Granton Point, the Committee resolved to delete from the draft agreement the clause providing that either party thereto might withdraw therefrom, in the event of Parliament making any material alteration thereon." Bailie Kinloch Anderson, however, said that the Works Committee had met that day, and had reconsidered the matter, after correspondence with their Parliamentary Solicitor, and they were of opinion that the clause should be restored. The clause was the 23rd, and provided that—"This agreement is made subject to the approval of Parliament; and in the event of any alteration being made by Parliament thereon, which, in the opinion of either of the parties, is a material alteration in the conditions of this agreement, it shall be in the power of either party to withdraw therefrom." The Commissioners resolved to restore the clause.

There is a gentleman who lives just outside the boundary of Portobello, who has a grievance with reference to the action of the Commissioners in reducing the price of gas in Portobello. The Portobello Gas Company made no difference in their charges, but sold their gas to all consumers at 4s. per 1000 cubic feet. When Portobello was amalgamated with Edinburgh, it was part of the agreement that the price of gas was to be the same in Portobello as in Edinburgh; and consequently it was reduced within what was formerly the burgh of Portobello to 3s. per 1000 cubic feet. This gentleman feels aggrieved that he, also, does not obtain gas at this price. He seems to have some property within the municipality; for at this week's meeting, a Portobello representative gave notice of a motion to consider and report on the conditions on which gas is supplied to consumers outside the city boundaries who pay municipal rates. This is a skilfully thrown net; but it is not likely to catch much. The Commissioners are not only entitled, but there is almost an obligation resting upon them, to charge more for gas consumed outside the city boundaries than within, because those who live outside escape the city rates—one of these being, if required, a gas contingent guarantee rate.

Sir Henry Littlejohn's report on carburetted water gas then came before the Commissioners, in the form of a request by the Corporation of Edinburgh for a conference on the subject. Bailie Kinloch Anderson said he approved of their holding the conference. They had the same object in view as the Public Health Committee; their desire being to supply gas which was perfectly healthy. If the Public Health Committee could convince them that this gas was unhealthy, he himself would be the first to move that they should not go in for it. But he believed that when the Town Council had before them the information on the subject which the Commissioners possessed, they would be as satisfied as the Commissioners were that this thing was perfectly in order. Power was given to the Works Committee to arrange for a conference.

Then a matter was brought up which it is unpleasant to contemplate. A letter was read, from a firm of accountants, stating that they had been instructed by a gentleman who took a deep and practical interest in civic affairs, to ask to be informed under what powers a large subscription was given by the Commissioners to the Edinburgh Diamond Jubilee Fund. The gentleman showed his sympathy with the movement by giving a donation of 100 guineas; but he could not see on what principle the Commissioners proposed to divert public money to such a purpose. Mr. Gibson raised the question of the gentleman's identity. Lord Provost Mitchell Thomson said that the client of this firm might not be a ratepayer at all, and might have no interest in the matter. He was only described as "a gentleman." He thought they should simply acknowledge receipt of the letter, and ask for the name of the client. This was agreed to. Now it is the case that the Commissioners have not the power to make such contributions; and this gentleman may proceed to the length of making himself unpleasant, by seeking to have the Commissioners compelled to refund the money. Further than this it is not likely that the incident will go. There are no negative provisions as to the

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 1226.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	23½—24½	..	4 5 9
100,000	10	,,	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	July 1	5	Australian 5 p. c. Db.	106—108	..	4 12 8
200,000	5	Nov. 11	6½	Bombay, Ltd.	6½—7½	+¼	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	,,	,,	9	Do. New	227—232	..	3 17 7
50,000	,,	,,	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	,,	June 11	4	Do. 4 p. c. Db. Stk.	135—139	..	2 17 6
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	273—278	..	4 2 8
208,820	,,	,,	8½	Do. A. Ord. Stk.	203—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56—57	..	3 18 11
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	,,	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½—10½	..	5 14 3
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16½—17½	..	4 11 8
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct. 14	13½	Commercial Old Stock	340—345	..	3 18 3
196,483	,,	,,	10½	Do. New do.	255—260	..	4 0 9
196,309	,,	June 11	4½	Do. 4½ p. c. Lb. do.	155—158	..	2 16 11
800,000	Stk.	June 11	12†	Continental Union, Ltd.	257—262	..	4 11 7
200,000	,,	,,	9†	Do. 7 p. c. Prf.	218—223	..	4 0 8
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	138—142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	26—27	+½	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 11
5,896,590	Stk.	Aug. 12	12¾	Gaslight & Coke, A, Ord.	315—318	..	4 0 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	113—118	..	3 7 10
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	222—227	..	3 6 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	204—209	+1	3 7 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	317—322	..	3 2 2
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	,,	June 11	4	Do. 4 p. c. Db. Stk.	139—142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	156—159	..	2 16 7
908,000	,,	,,	6	Do. 6 p. c. do.	207—213	..	2 16 7
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	215—220	+2	4 10 11
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104—107	..	3 5 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	June 29	6	Malta & Medn., Ltd.	5½—6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Mel-bourne & Db.	5 p. c. 4½ p. c.	112—114	..	4 7 8
250,000	100	,,	4½			107—109	..	4 2 7
541,920	20	Nov. 11	5*	Monte Video, Ltd.		14½—15½	..	6 9 0
150,000	5	Nov. 26	8	Oriental, Ltd.		8—8½*	..	4 14 1
135,000	5	,,	8	Do. New, £4 10s. pd.		7—7½*	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.		1—2*	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.		4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas & 1st M. Bd.		104—109	..	5 10 1
500,000	100	Dec. 1	6	of Chicago & 2nd do.		103—108*	..	5 11 1
250,000	10	Sep. 30	10	San Paulo, Ltd.		16—17	..	5 17 3
135,000	Stk.	—	10	Sheffield A.		250—253	..	3 19 0
209,053	,,	—	10	Do. B.		250—253	..	3 19 0
447,4.7	,,	—	10	Do. C.		250—253	..	3 19 0
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord		144—147	..	3 11 5
1,416,667	,,	July 15	3	Do. 3 p. c. Db. Stk.		106—109	..	2 15 0
60,000	Stk.	Sep. 15	12	Tottenham and & A.		280—290	..	4 2 9
60,000	,,	,,	9	Edmonton & B.		205—215	..	4 3 9
182,380	10	May 27	8	Tuscan, Ltd.		13½—14½	..	5 10 1
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.		102—105	..	4 15 3
				WATER COMPANIES.			
746,159	Stk.	June 29	10½	Chelsea, Ord.		337—342	..	3 1 5
150,000	,,	,,	5	Do. 5 p. c. Prf.		177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p.c. 1 f. Stk., 1875		157—160	..	2 16 3
175,785	,,	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.		160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.		232—236	..	3 3 8
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.		163—166	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Db. Stk.		106½—107½	..	2 15 10
700,000	50	June 11	7½	G'd Junct'n, 10 p. c. max.		123—128	..	2 18 6
295,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.		147—152	..	2 12 8
708,000	Stk.	Aug. 12	13	Kent		362—367	..	3 10 10
160,000	,,	,,	7	Do. New, 7 p. c. max.		215—220	..	3 3 7
1,043,800	100	June 29	10†	Lambeth, 10 p. c. max.		305—310	..	3 4 6
406,200	100	,,	7½	Do. 7½ p. c. max.		227—232	..	3 4 8
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.		147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares		450—455	..	2 17 1
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.		152—155	..	2 11 7
902,300	Stk.	June 29	5	Southw'k & V'xhall, Ord.		163—166	..	3 0 2
126,500	100	,,	5	Do. do. 7½ p. c. max.		151—154	..	3 4 11
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.		175—180	..	2 15 6
1,019,585	,,	Oct. 14	4	Do. 4 p. c. A Db. Stk.		144—147	..	2 14 7
1,155,066	Stk.	June 11	10	West Middlesex		322—325	..	3 1 6
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.		162—166	..	2 14 3

* Ex div. † Next dividend will be at this rate.

application of the revenues of the Commissioners; and this gentleman, although he were to turn out to be a ratepayer and consumer of gas, will find it hard to obtain a title to have the Commissioners ordained not to do a thing which is not expressly forbidden. He could not obtain interdict against an act which is months past; nor could he secure an injunction against the repetition of this act, unless he could aver that there was a likelihood of its repetition—which there cannot be for at least other sixty years. He might sue to recover; but there are no penalties for mal-administration, and therefore he would have nothing to vindicate. All he could do would be to sue for declarator that the Commissioners were bound personally to refund the money contributed. But he could only do this upon the plea of personal prejudice; and there he would fail upon the facts, because the £250 which the Commissioners contributed would, if added to the revenue, have made no difference in the price of gas. There is also against this gentleman's success, the fact that no Act of Parliament is administered strictly; and that, in judging of digressions, the reasonableness of the lapses must be considered. And here I do not think that a contribution of £250 for the purpose of extending the Royal Infirmary, by a body employing hundreds of men, most of whom take advantage of the hospital, is unreasonable.

The inauguration of the new gasholder at Bo'ness, to which I referred last week, took place on Monday. The holder, and other extensions of plant, costing in all about £7000, were probably the last works which the late Mr. R. Mitchell was connected with. He was Consulting Engineer to the Bo'ness Gas Company. The inauguration ceremony was performed by the Chairman of the Company (Mr. W. Thomson).

The action by Mrs. Warwick, of Dumfries, against the Glasgow and South-Western Railway Company, which was to have been tried by a jury in the Court of Session, has been settled. The pursuer's husband, who was in the employment of the defenders, was killed, under circumstances already reported in your pages, while in charge of two waggons loaded with coal, which were being conveyed from the railway goods yard to the Dumfries Gas-Works. The action was originally brought against the Glasgow and South-Western Railway Company as employers, and also against the Caledonian Railway Company as the owners of the waggons. The latter Company, however, successfully appealed to the House of Lords to be dismissed from the action (*ante* p. 1121). The Glasgow and South-Western Company have now, rather than go to trial, settled the case by a payment of, it is reported, £200 together with a sum towards expenses.

The members of the Leith Gas-Workers' Sick Benefit Society held their annual soirée, concert, and ball last night. Mr. W. R. Herring presided. He said that the Society appeared to be well managed, and had evidently done a great deal of good among the members. During the two and a half years of its existence, there had been 117 individual cases of assistance, at an expenditure of £157 18s. 6d.; and death payments amounting to £400 had been made. Mr. John S. Gibb, the Treasurer to the Gas Commission, explained the proposed superannuation scheme, which he described as one of the most important things the Commissioners had had under their consideration for a long time, and which, he said, would not interfere in the slightest degree with the objects of the Society.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 4.

Sulphate of Ammonia.—The weakness in the market noticed in the last reports has continued; and, owing to re-selling, prices have been somewhat irregular. At the close, however, there is more inquiry, though buyers' views are below current values; £8 12s. 6d. per ton having been refused repeatedly f.o.b. Leith. Closing quotations are £8 15s. f.o.b. Leith and Hull, £8 16s. 3d. f.o.b. Liverpool. Makers have for the most part remained firm—the large makes being sold well into December; but any parcels put on the market have had to be disposed of at current prices. Speculators have been diligently engaged in depressing the market, by making quotations below makers' prices, and by endeavouring to keep consumers away from December. Their tactics have been successful, so far, in keeping consumers back. But "bear" and consumers' requirements will have to be filled; and all that is needed on the part of makers would seem to be firmness and patience. Weakness on their part would play into the hands of the "bear" interest. In the forward position, makers are firm at last prices paid; but there is no business reported.

Nitrate of Soda is firm at 7s. 6d. per cwt. for good, up to 7s. 9d. per cwt. for refined, quality on spot.

LONDON, *Dec.* 4.

Tar Products.—With the exception of creosote, which keeps in good demand at improving prices, this market is extremely disappointing all round. Benzol buyers appear to have shut their books for the time being; and business at the moment is impracticable. Pitch is weak. There are no important stocks; and it is remarkable, under these circumstances, that this article is so demoralized. A large business in anthracene has improved the tone of that article, although there is no advance in value. With the present position and prospects of tar products, distillers will have a heavy loss on prices that have recently been paid for tar contracts.

The average quotations for the week are as follows: Tar, 14s. to 19s. Pitch, 16s. to 19s. Benzols, nominal, 90's, 1s. 7½d.; 50's, 1s. 9d. Toluol, 2s. Solvent naphtha, 1s. 6½d. Crude, 30 per cent., naphtha, 9d. Creosote, 2¼d.; filtered liquid, 3d. Heavy oils, 42s. 6d. to 52s. 6d. Carbolic acid, 60's, 2s. 1d. Naphthalene, 55s.; salts, 30s. Anthracene, "A," 5d. to 5½d.; "B," 4d. to 4½d.

Sulphate of Ammonia is dull. An unaccountable lassitude has taken hold of the market. Practically no business is being done at the moment; and values are, therefore, nominal, and range from £8 12s. 6d. to £8 15s., less 3½ per cent., at all ports.

Gas Workers' Hours and Wages at Blackburn.—The Gas Committee reported at last Thursday's meeting of the Blackburn Town Council that a letter had been received from the Secretary of the Gas Workers' and General Labourers' Union, with reference to the readjustment of hours of labour and wages at the gas-works; and it had been referred to a Sub-Committee. The letter asked that an increase of 6d. per day be granted to all wheelers, and that the firemen be paid the same wages as stokers—viz., 5s. 4d. per shift of eight hours, instead of 5s.

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the colder weather of the past week, there has been more inquiry stirring in the better qualities of round coal; but apart from this, the position remains without any very material change. Where collieries were either running about four days per week or putting small quantities into stock, they are now generally working full time; and the output is moving away without much difficulty. Prices for the better qualities of round coal are steady at the list rates ruling last month; and there is less under-quoting for prompt clearance sales. At the pit mouth, the better qualities of Wigan Arley are now listed at from 10s. up to 11s. per ton in special cases; Pemberton four-feet and seconds Arley, 8s. 6d. and 9s. up to 9s. 6d.; and common house coals, 7s. to 7s. 6d. The lower qualities of round coal still move off but moderately, and as there would scarcely seem to be much probability of a general resumption of operations at the engineering works until after the turn of the year, no very material improvement can for the moment be looked for. Shipping is, however, taking off a good deal of coal just now; and this is helping to steady prices, which are averaging about 6s. 6d. up to 7s. per ton at the pit mouth for good qualities of steam coal. For shipment, though there are some of the lower qualities still obtainable at 7s. 9d. to 8s. per ton, the better sorts are fetching readily 8s. 3d. to 8s. 6d., delivered at the ports on the Mersey. Supplies of engine fuel continue ample; but prices are without quotable change.

Northern Coal Trade.—The coal trade of the North has been deranged by the storms, which have interfered with the arrival of vessels, and consequently with the shipment of coals. For prompt delivery, coals have thus been easier. Northumbrian steam coals are lower; the shipments being small, and likely to continue so for a month or two. Best steam coals are nominally 8s. per ton f.o.b., though sales at lower prices are known; second-class steam vary from 7s. 6d. to 7s. 9d.; and steam smalls are 3s. to 3s. 3d. The gas coal trade is now at its briskest point; the demand being extremely heavy. For supplies beyond contracts, as high as 8s. to 8s. 3d. per ton is asked; and the former figure has been paid. Gas coke is in abundant supply; but the household consumption is heavier. There is no alteration in the price this week.

Scotch Coal Trade.—The extremely mild weather which has been experienced till recently has had a disturbing effect upon the coal trade. The demand for house coal has been so small that large quantities have been forced into export. Even with the relief obtained in this direction, stocks have so grown that prices are not likely to go much higher. All sorts are affected by the plethora of house coal—so much so that the advance in price which is always experienced in October or November has not yet taken effect; an attempt last week to advance splint 3d. per ton not having been very widely adopted. The rates quoted are: Main, 6s. 9d. to 7s. per ton f.o.b. Glasgow; ell, 7s. 3d. to 7s. 6d.; and splint, 7s. 6d. Higher freights are telling upon shipping. The shipments last week amounted to 165,921 tons—a decrease of 14,379 tons on the previous week, and of 2785 tons on the corresponding week of last year. For the year to date, the shipments have amounted to 7,466,556 tons—an increase over the same period of last year of 401,209 tons.

Malvern Link Gas-Works Transfer.—In connection with the arbitration which is to be held to settle the terms upon which the Malvern Link Gas-Works are to be transferred to the District Council, we learn that Mr. Corbet Woodall has been appointed Arbitrator for the Company, and that Mr. R. H. C. Nevill, the Chairman of the Gas Committee of the Malvern District Council, will represent the Link Council.

The Gas Supply of Chicago.—By cash payments recently made to the M'Millan Syndicate for the Universal and Mutual Gas Companies of Chicago, the People's Gaslight and Coke Company have obtained the control of practically the entire gas-supply area of the city; the only portion in other hands being that served by the Ogden Gas Company, whose district is very limited. The People's Company will take charge of the Mutual concern; while the Universal will be financed by a friendly Syndicate.

An Unusually Low Arrears Account at Longwood.—Not many gas companies enjoy of so low a percentage of arrears as that at Longwood, near Huddersfield. Of the half-yearly rental due on July 1 last, amounting to a total of £3062, only £3 4s. 1d. now remains outstanding, though there is still another month to elapse before the next half-year's accounts become due. This works out at 0·09 per cent., or about 2s. per £100. Out of nearly 3000 consumers, only eight have been summoned. The price charged for gas is 3s. per 1000 cubic feet, with 5 per cent. off for lighting, and 15 per cent. for heating and cooking purposes, providing the accounts are paid within two months after becoming due. Gas-engines are supplied at 2s. 3d. per 1000 cubic feet, less 5 per cent.

Grand Junction Water-Works Company.—At the half-yearly meeting of this Company to-morrow, the Directors will report that, after providing for special expenditure to the amount of £4492 for lowering mains, and of £515 for their proportion of expenses connected with the Staines Reservoirs scheme, the balance of profit will admit of a dividend at the rate of 7½ per cent. per annum on the ordinary shares as before. The Directors recommend the declaration of this dividend on the "A," "B," and "C" shares, and one at the rate of 7 per cent. per annum on the "D" shares. The accounts show that the capital expenditure in the six months ending Sept. 30 amounted to £49,834, chiefly on the duplication of the 33-inch main between Hampton and Kew Bridge, and on the provision of increased filtration area and engine power.

Cookery Classes in Auckland (N.Z.).—The Auckland (N.Z.) Gas Company are determined that no effort on their part shall be wanting to popularize the use of gas for culinary purposes. They have established, under the supervision of Mrs. Ross, a number of cookery classes in various parts of the city. One of these is at the rear of the Company's offices; and the productions are served up at luncheon-time at restaurant prices. A representative of the "New Zealand Herald" paid a visit to the luncheon-room, and there partook of his midday meal—at the same time making himself acquainted with the whole of the arrangements. The result was a lightly-written article commending the Company's action, and emphasizing the value of a knowledge of cookery. The Company's example has been followed in one large manufacturing establishment in the city, where any of the young working girls have an opportunity of learning cooking under Mrs. Ross.

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For full Particulars

See our Lists.

The Rating of Metropolitan Reservoirs.—At the meeting of the Sunbury District Council yesterday week, a report was presented upon the question of the rating of Metropolitan Water Companies' reservoirs. It appeared that deputations from the Sunbury, Hampton, and Molesey Authorities met at Hampton on Nov. 17, when Mr. Kent, Clerk to the Hampton Council, stated that notice of appeal by the Southwark and Vauxhall Water-Works Company had been served, and that the appeal had been carried to the Queen's Bench Division, against the decision of the Magistrates allowing the rate in respect of reservoirs on the full annual rate (see *ante*, p. 953). It was resolved that a combined deputation should wait on the Local Government Board, and make application for the Board's approval to jointly defend the decision of the Magistrates, and that the deputation should consist of the Chairmen of the three Councils, and that Sir Frederick Dixon-Hartland be asked to introduce the deputation. It was also proposed that the Sunbury and Molesey Councils should proceed against any Water Companies in their districts who declined to pay on the full amount of the rateable value.

Sales of Shares.—Shares to the nominal value of £1200 in the Colwyn Bay and District Gas Company have lately been sold for £1942 10s. The prices obtained for eight lots of the nominal value of £50 each varied between £75 10s. and £78; and for the remaining eight lots of the nominal value of £100 each, between £162 and £173. Three £10 shares in the Slough Gas Company have recently been disposed of at £24, £25 5s., and £25 15s. respectively. At the Mart, Tokenhouse Yard, E.C., last Wednesday, Messrs. Fox and Bousfield sold parts of freehold King's shares in the New River Company at an average rate of £116,400 per share; also 3 per cent. "C" debenture stock at £116 10s. per cent., *ex div.* Some shares in the Salisbury Gaslight and Coke Company were sold by auction last Tuesday. Four original ordinary 10 per cent. £12 10s. shares, realized £32 7s. 6d. each; and a second similar lot, £31 10s, each. Two new ordinary 7 per cent. £12 10s. shares sold for £20 each. Out of twenty 5 per cent. £25 debentures, two went for £34 5s. each, twelve for £34 each, four for £33 10s. each, and two for £32 10s. each. On Thursday a sale of shares in the Gravesend and Milton Water-Works Company took place at Gravesend; the shares offered being mostly of the early issue, which participates in a sum of £60,000 of arrears of dividend yet to be distributed. The prices realized were £66 and £68 each for £20 shares.

Damage to Gas-Works by Flood.—Chatham, Rochester, and Strood, in common with other towns in the country which are in any way affected by the tides, had an extraordinary and unparalleled experience on Monday last week, in consequence of the terrible gale that prevailed during Sunday night. The fearful wind at sea had the effect of creating a tremendously high tide, with the result that all the low-lying parts of the district were completely submerged, causing considerable damage to property and inconvenience to residents. The inhabitants generally throughout the district suffered owing to the gas-works, which are situated at Rochester, being practically flooded; the supply of gas being so meagre that the three towns were in semi-darkness during the long evening. But for the prompt and untiring efforts of the Company's Secretary and Manager (Mr. J. M. Veevers), of Mr. Vanheson (Superintendent of the works) and Mr. Walter Hole (Superintendent of the outdoor department), there must have been a total absence of gas. Their efforts were continued throughout the next day; and they were successful in securing a moderate supply of gas for Tuesday night—sufficient to light, in some parts of the district, both the shops and street lamps. When a press representative was conveyed to the gas-works early on Tuesday morning, the occupants of the houses of the departmental managers could only communicate with the outside world by means of boats; and even later in the day, the works were to a great extent still under water. At Felixstowe the gas-works were flooded to the depth of 18 inches, and the fires put out. The gas supply was consequently cut off; and the meeting of the District Council on Wednesday had to be held by the light of candles and oil-lamps. At Harwich the gas-works sustained damage. However, considering the unusual severity of the recent gale, it is marvellous that a greater number of cases of interference with the supply of gas through the flooding of the works have not to be recorded.

Middlesbrough Ratepayers and the Management of the Gas-Works.—A meeting of ratepayers of Middlesbrough was held last Thursday to consent or otherwise to the promotion by the Corporation of a Bill in Parliament, to confer on them further powers in connection with the gas-works. The Mayor, who presided, said he thought the proposal was one that would raise no debatable question whatever. If they did not obtain the additional powers they sought, the tradesmen and other ratepayers would soon find themselves in the dark. This matter had been put off as long as it was possible; but now, in face of the increasing demands, they must make the necessary provision. He therefore moved that the meeting consent to the promotion of the Bill. Alderman Hugh Bell seconded, and explained that all their powers to carry out extensions were now exhausted, and it was necessary to seek for more. Replying to a question, he added that the Corporation were asking for compulsory powers to acquire a small piece of land (between 500 and 600 square yards), the cost of which would only run into three figures. Mr. Mosses, who had asked the question, said, in his opinion, the Gas Committee had made a series of expensive blunders in the past. They had spent large sums of money apparently without results; for the gas was poor in quality and not cheap in price. He believed in municipalization; but he must confess that if anything could disgust the ratepayers, it was the manner in which the Committee's business had been carried on. The profits even did not compare favourably with such places as Newcastle, where the gas supply was in the hands of a Company—realizing only about 3 per cent. instead of 8 per cent. They had built a holder that would not hold gas, and had otherwise wasted revenue. To pay 27s. 6d. a yard for land which was probably worth only 4s. or 5s., was carrying the thing too far. Alderman Bell stated that the present application was being made on the advice of an expert. On being put, the motion was lost, although there were less than thirty present in the audience. Alderman Bell thereupon said it was his duty to ask for a poll, as it was essential to the interests of the ratepayers that they should proceed with the Bill. Alderman Archibald having remarked that the Committee were seeking to get more river frontage, so that they might land their coal, the Mayor declared the meeting adjourned.

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ST. CATHERINES	(Second Contract) One New Set.
BRANTFORD	(Second Contract) One New Gasholder.

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WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	HALIFAX	1,000,000
COLCHESTER	300,000		
BIRKENHEAD	2,250,000		
SWINDON (New Swindon Gas Company)	120,000		

The Russian Petroleum Industry.—With a view to encouraging the export of petroleum, the Railway Tariff Committee have, according to a Reuter telegram, reduced the tariff on kerosene between Baku and Batum from 19 to 12 kopecks per pood.

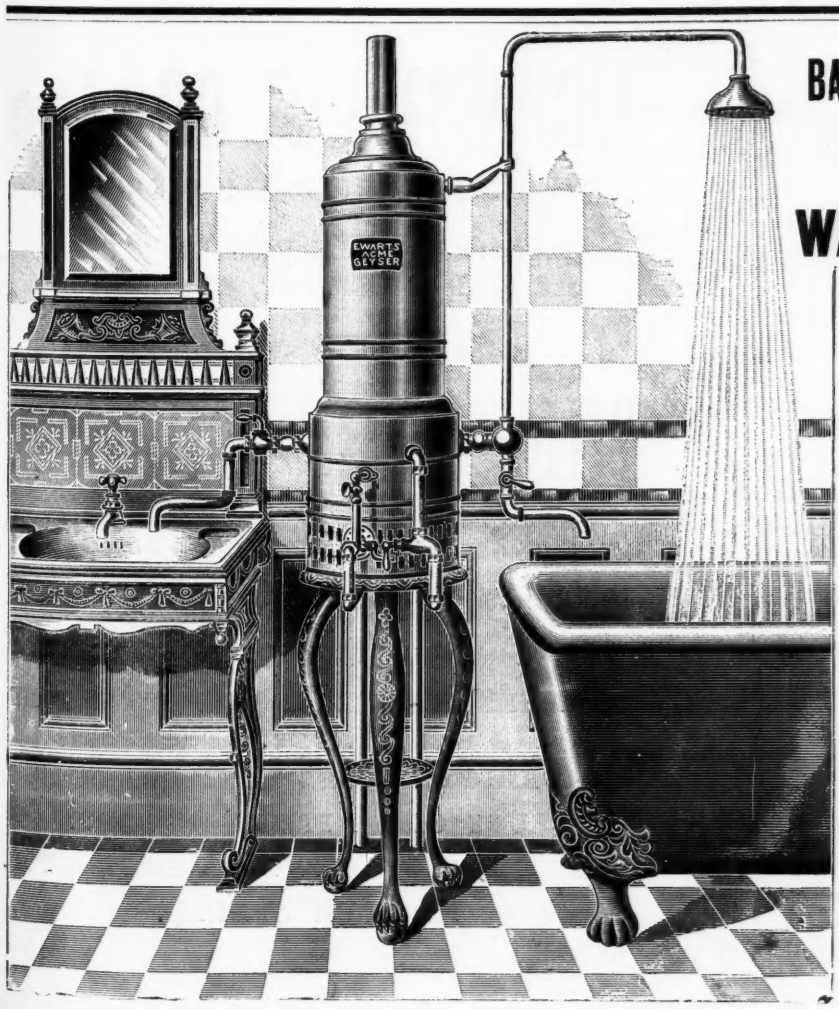
The New Issue of Debenture Stock of The Gaslight and Coke Company.—In accordance with the announcement which appeared in our advertisement columns, Mr. Alfred Richards offered for sale last Tuesday, at the Mart, Tokenhouse Yard, E.C., £30,125 of 6 per cent. perpetual debenture stock of The Gaslight and Coke Company. It was put up in £100, £50, £10, and £5 lots, to suit all classes of investors; and there was plenty of competition for it. The first lot was knocked down at £209; but the next twelve lots went for £208 10s. A large quantity of the stock was sold at £208 and £207. When the £50 lots were reached, the first ten were knocked down at the latter figure; then an advance of 5s. took place, followed by another of 2s. 6d. The last four of these lots fetched £207 5s., at which figure all the £10 and £5 lots, with an additional £125 of stock, were disposed of. The total amount realized by the sale was £62,497 13s. 9d.; being an average of £207 9s. 2d. per £100, which will return the purchasers £2 17s. 10d. per cent. Seeing that the interest on this stock only accrues from the 1st inst., and that the old 6 per cent. stock was quoted last Thursday at £207 to £212 (which, of course, carries five months' dividend), the prices realized at the sale may be regarded as satisfactory.

The Gas Workers' Union and the Bristol Gas Company.—At a meeting of the Bristol and South-Western branch of the Gas Workers' Union last Tuesday, the Secretary (Mr. W. Thorne) stated that a petition had recently been sent to the Directors of the Bristol Gas Company, asking, first, that the wages of the yardmen should be increased from 3s. 6d. to 4s. per day, and, secondly, that the stokers should be paid time-and-a-half for work between six a.m. and ten p.m. on Sundays. In reply, the Secretary of the Company wrote: "In October, 1889, the Board, at the request of the working men, agreed for the future that all questions respecting the relations of the working men and the Company should be discussed, first, with the Engineers, and, failing this, that the workmen should interview the Board." He (Mr. Thorne) found by carefully going over the letter that there was no intention to snub the Union. They had first to meet the Engineers with a view of coming to a settlement; and if this did not succeed, they must appoint a deputation to wait on the Directors of the Company. As far as asking for extra pay for Sunday work was concerned, he thought they had a good case, for in all the large towns, with very few exceptions, double time or time-and-a-half for Sunday work was paid; and he did not think it was an outrageous demand to ask for 4s. instead of 3s. 6d. for the yardmen. He hoped they would be able to settle the matter without going to extremes. The Chairman (Mr. T. Sweet) asserted that there were many abuses at the stations; but he did not think it was the fault of the Directors. He believed they had a good Board; and that it was the foremen and the Managers who were to blame. A general discussion followed, in which it was said that the men were asking for an increase of wages which it was thought they could justly claim. It was agreed that a deputation be appointed to interview the Chief Engineer.

Thirlmere Water-Works Arbitrations.—The Manchester City Council last Wednesday had their attention directed to the heaviness of the legal expenditure of the various Committees. In the course of the discussion, Sir John Harwood, the Chairman of the Water Committee, gave the interesting information that, in connection with the Thirlmere Water-Works, there had been five cases of arbitration, in which the total amount of the claims was £255,728; whereas under the awards the Corporation had only had to pay £46,498, which was equal to a saving of £209,230. He thought these figures would show that the Corporation had no other course open to them except that of arbitration, and that the result had been eminently satisfactory as safeguarding the interests of the ratepayers.

The Quality of the Stockport Water.—Judging from what appears in the "Stockport Advertiser," efforts have been made for some months past to show that the water supplied in the extensive area of the Stockport Water Company—comprising Stockport and its suburbs, Wilmslow, Alderley, and many other places—was "not fit to drink." Of course, the complainers sought to ventilate their imaginary grievances in the paper referred to; but before giving insertion to the numerous letters received, the Editor put himself in a position to judge whether or not the water was pure—a conscientious course in striking contrast to that usually pursued by the conductors of newspapers. Finding as the result of his investigations that the supply was unimpeachable, he declined to insert the letters; and in so doing he only acted in the public interest. The Directors of the Company have had the water examined by Dr. Percy Frankland, F.R.S, who has reported that the Lyme Park water is of "good quality," the water obtained from the Manchester Corporation is "remarkably pure," and the Wilmslow water is of "unusual purity." Better reports than these it would be impossible to conceive; and if they do not satisfy the consumers, nothing will.

Water-Works Improvements at Hull.—The Engineer of the Hull Corporation Water Committee (Mr. Bancroft) has submitted to his Committee an important proposal for the improvement of the water-works system, and which, for safety, appears to be necessary, as if, under present circumstances, a breakdown occurred causing a temporary disablement at either Springhead or Cottingham, the supply would be seriously affected. To meet any emergency, Mr. Bancroft suggests that a pipe of 36 inches diameter should be laid from Springhead into a high-service reservoir to be constructed on high ground at Willerby; and through this the water should be constantly pumped. The advantage of this arrangement would be that the reservoir would act as a safety-valve, receiving water when the quantity pumped was more than the city required, and would help the supply to the city when the quantity pumped was less than that needed. It is suggested that the reservoir should contain 10 million gallons; and Willerby, a village a few miles from Hull, is recommended as the site from which water could be supplied to a large area, including neighbouring villages, by gravitation. The total cost is estimated at £118,000, of which £60,000 is for the reservoir; £35,000, for connecting mains from Springhead and Stoneferry; £20,500 for a duplicate main from Cottingham, and £3000 for an additional main to Hessle.



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Brighton Corporation and the Aldrington Estate Water Company.—The Brighton Corporation last Thursday adopted without debate a report by the Water Committee favouring a proposal to purchase the undertaking of the Aldrington Estate Water Company, at a total cost of £25,000.

A Gas Worker Suffocated at Colne.—A labourer named John Collins, employed at the Colne Corporation Gas-Works, was engaged in cleaning out a sulphur-recovery plant last Thursday, when he was overpowered by gas fumes. Medical aid was summoned, and artificial respiration, together with an application of oxygen, was tried, but without avail; and Collins succumbed an hour after being discovered.

Municipal Water Undertakings in America.—According to some statistics given in the "New York World," 53 per cent. of the water-works in America are owned by public authorities; only nine of the largest cities being dependent upon private companies for their supply. Since 1890, no fewer than 200 cities and towns have adopted public ownership. In Massachusetts there are 113 public, as against only 38 private works; and the proportion in favour of public ownership will, it is expected, be soon much larger.

Abatement of the Typhoid Epidemic at Maidstone.—For the first time since Sept. 1, the date of the outbreak of the epidemic of typhoid fever at Maidstone, no fresh cases were reported last Tuesday. On the following day, at the usual meeting of the Urban District Council, the Medical Officer of Health (Mr. M. A. Adams), in reply to a question, said he was convinced that no single case of typhoid had arisen for some time from the water supplied to the town; and he believed any fears entertained on account of the water were entirely unfounded. With regard to the mortality resulting from the epidemic, he could not give the latest statistics, but he believed the rate was about 7 per cent. It has since been reported that there have been 1879 cases, of which 140 were fatal.

Kingsbridge Water Supply.—After deliberating over the matter for about twelve months, the Kingsbridge Urban District Council decided last Wednesday not to take any further action with regard to the scheme for obtaining a supply of water by gravitation from the estate known as Borough. Messrs. Beesley and Son, who were consulted as Engineers in reference to the scheme, estimated that the cost of making a storage reservoir of 3 million gallons capacity would be £3500. Mr. Hurrell, the Chairman of the Council, expressed the opinion that the total cost would be from £9000 and £10,000, and that there would then not be sufficient water for their requirements. It would be better to go to the river (the Devonshire Avon), where they could obtain an unlimited quantity of water by pumping. It was pointed out that the cost of pumping would be about £80 per annum; and some of the members thought that, with the cost of filtration and other expenses, the river scheme would entail as heavy a burden as the Borough scheme. In the end, however, seven members voted for and five members against abandoning the proposal to acquire the Borough Estate.

New Joint-Stock Companies.—The Freshwater Gas Company, Limited, has been formed with a capital of £12,000, in £5 shares, to manufacture, sell, and supply gas in the parishes of Freshwater and Totland Bay, in the Isle of Wight. The White and Middleton Gas-Engine Company, Limited, has been registered with a capital of £200,000, in £1 shares, to acquire certain inventions relating to improvements in the construction of oil, gas, and steam engines, and any patents, patent rights, and inventions, particularly with regard to the White and Middleton gas-engine. The Maxim Carbide Process and Acetylene Gas Syndicate, Limited, has been formed with a capital of £2500, in £1 shares, to acquire and work certain patents relating to the manufacture of calcium carbide or acetylene gas, and to adopt an agreement made with J. T. Carrington. The Wey Valley Water Company, Limited, which has been registered with a capital of £20,000, in £10 shares, is to carry on business in the counties of Surrey, Southampton, Sussex, and elsewhere. British Incandescent Mantles, Limited, is the title of a Company formed with a capital of £8500, in £1 shares, to carry on the business of an incandescent light company, and, in particular, to manufacture mantles, fittings, &c., to light towns, streets, and shops, and to turn to account patents and patent rights.

Water Schemes in the Carlisle District.—An inquiry was held at Brampton last Tuesday week by Mr. R. H. Bicknell, an Inspector of the Local Government Board, respecting an application by the Brampton District Council for sanction to borrow £7500 for the purpose of supplying Hayton, Irthington, and Castlecarrock with water from the Tarnmonath Spring, one of the sources of the River Gelt which is included in the scheme for supplying Carlisle with water. This would have been regarded at one time as a solution of a difficulty with which the District Council, and its predecessor the Rural Sanitary Authority, have struggled for many years; but now it is complicated by the Carlisle project. The proposal of the Corporation is to take powers to supply any villages on the line of their main which may want a supply of water delivered within their own boundaries. The people of Hayton and Castlecarrock, through their representatives, have declared in favour of taking water from Carlisle; but the parish of Irthington (with the exception of some of the ratepayers) prefer the scheme of the Brampton District Council. The views of the various parochial authorities concerned and of the Corporation of Carlisle were laid before the Inspector. In the course of the proceedings, it transpired that the Earl of Carlisle had recently transferred to the Brampton District Council the spring which they desire to use, together with a gathering-ground of 150 acres. This involves a diversion of 500,000 gallons a day from the water supply which the Corporation had counted upon as part of their 2½ million gallons—or one-tenth of the whole; but as the Carlisle project provided for the supply of the villages which the Brampton scheme would supply, it will not matter materially so far as the supply of water is concerned whether the water is taken at the source or in its course through the Carlisle main. There will still remain available for Carlisle (according to the calculations of the Engineers) water enough to meet the requirements of the city for some 50 years; and if the supply should in after years run short, there are other sources from which it could be supplemented *en route*. The report of the Inspector will, however, be looked forward to with interest as showing the views of the Local Government Board as to the multiplication and duplication of water-works when one scheme will answer all purposes and save money.

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Messrs. Joseph Taylor & Co., of Bolton, have recently received orders for their latest make of solid-plate lead sulphate saturators for the Croydon, Rochdale, Dukinfield, and Atherton Gas-Works; the combined weight of the four being some 24 tons, and making in all eight solid-plate saturators placed with the firm since June last.

The enterprise displayed by the representatives of the Economical Gas Apparatus Construction Company, Limited, of Abingdon Street, Westminster, and especially of the Manager (Mr. J. T. Westcott, M.E.), since they commenced operations in this country a few years ago, has been the subject of not a few commendatory remarks by those who have had business relations with them; and a further proof of it has just been given in the preparation of an exceedingly useful illustrated description of their water-gas plant, large installations of which, as our readers are aware, have been put up at Birmingham and Birkenhead—smaller ones having been erected at Blackburn, Colchester, Halifax, and New Swindon. The plant at Birmingham is illustrated by eight plates and two plans; that at Birkenhead, by nine plates and a plan; and plans are given of the Blackburn, Colchester, and New Swindon plants. The rest of the contents consists of illustrated descriptions of the Company's double generator and other portions of the apparatus, together with literary matter bearing upon the subject of carburetted water gas. The book, on the whole, will be found very useful to gas managers for the information it supplies in a convenient form; while its appearance ought to justify a place being found for it upon the office-table.

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HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 35,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see p. 1218.]

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.

Correspondence invited.

Telegraphic Address: "SADLER, MIDDLESBROUGH."

LLEWELLYN JONES & T. B. YOUNGER, CONSULTING ENGINEERS, VALUERS, &c., CHESTERFIELD HOUSE, 98, GREAT TOWER STREET, E.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.

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SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1769.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A 1." for Mouthpiece Joints. Satisfaction Guaranteed.
CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ADVERTISER (age 20) desires a Situation as METER INSPECTOR and PREPAYMENT METER COLLECTOR. Four-and-a-half Years' Experience in present Situation.
Address No. 2971, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Meter Tester (Ordinary, Automatic, and Experimental). Could fill up time with Gas Fitting, or Meter repairing, reading, or collecting, or other work. Advertiser has been used to the Gas Trade all his life.
Address W. B., 36, Waterloo Sq., CAMBERWELL, S.E.

A GAS-WORKS Manager now abroad wishes to place his Son (age 17), who has been educated in England, as PUPIL with a Gas Engineer of established reputation in this Country.
State Particulars, Premium required, &c., in confidence, to No. 2967, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Main and Service Layer.
Apply, stating Age, Experience, and Wages required, to No. 2973, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TWO Gas Stokers wanted at once. Must be good Shovel Chargers, and sober, reliable Men. Wages 30s.
Apply to A. W. ELTON, Engineer and Manager, Gas-Works, LITTLEHAMPTON.

PUPIL.

THE Engineer of a large Provincial Gas Company has a vacancy for a PUPIL. Premium required.
Address No. 2972, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF MOSSLEY.

THE Gas and Lighting Committee are prepared to receive applications for the appointment of GAS MANAGER at their Works.
The amount of Gas made last Year was 94,200,000 cubic feet; there are 36 miles of Mains in the supply district; and the Retorts are primarily on the Regenerative System.
Applicants must state Age, Qualifications, and Salary required, and must send *copies only* of not less than Three recent Testimonials.
The applications must be sent to the undersigned, endorsed "Gas Manager," not later than the 14th of December next.
JOSEPH HYDE,
Town Clerk.

SULPHURIC Acid for Sale B.O.V. and R.O.V. made from Sulphur. Inquiries solicited.
J. HARDMAN, Chemical Works, Milton and Tunstall, STAFFS.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

FOR SALE—Four Strong Wrought-Iron TUBES, 7 ft. by 40 ft.; others down to 2 ft. 4 in. diameter, suitable for Scrubbers, Condensers, and Foul Mains, £5 per ton. CAST PIPES, 10 inches and 14 inches diameter, Faced Flanges, equal to new, with Bends, £4 15s. per ton.
Apply, by letter, to No. 2959, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD, owing to the removal of Works, the following second-hand Materials:—
Four PURIFIERS, 10 ft. by 7 ft. by 8 ft. 6 in., with WROUGHT-IRON COVERS, Lifting Apparatus, Thorncliffe Centre-Valve, and Connections complete.
One Set of CONDENSERS, consisting of 32 8-inch Pipes.
A DONKIN 7-inch Exhauster BYE-PASS VALVE.
One 7000 cubic feet per hour STATION METER, in well-designed square Case, with 8-inch Hydraulic Valve and Bye-Pass. The Drums, Case, and Index are in good condition.
Apply to the MANAGER, Gas-Works, Hitchin, HERTS.

WANTED Carbon. State Price for 4-ton Lots, delivered at nearest Station.
Address No. 2960, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PURE, faultless Thorium (High Lighting Power guaranteed) is supplied regularly, on very moderate Terms.
Please address J.Y., 6965, care of Rudolf Mosse, BERLIN, S.W.

FOR SALE—300 14-in. Street-Lanterns, with Cradles, in good condition. Reasonable offers will be considered.
Apply to the ENGINEER and MANAGER, Brentford Gas Company, High Street, BRENTFORD.

GAS Plant for Sale, almost new, consisting of four LIME PURIFIERS, 8 ft. by 4 ft., with Washer and Centre-Valve, 6-inch Connections, made by Clapham Bros., Keighley.
Apply to JAMES WRIGLEY AND SON, LIMITED, Bridge Hall Mills, Bury, LANCS.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE — A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.
For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

DISUSED Plant for Sale—viz., 500,000 Cubic Feet WALKER'S PATENT PURIFYING MACHINE; Eight PURIFIERS, 12 ft. Square; 250,000 Cubic Feet KIRKHAM, HULETT, and CHANDLER'S WASHER-SCRUBBER; MANN and WALKER'S TOWER SCRUBBER, 5 ft. by 38 ft.
Apply to the GAS-WORKS, HARROGATE.

TONBRIDGE GAS COMPANY.

TENDERS are invited for the supply of a 15-inch STEEL FOUL-MAIN; also for a Set of CONDENSERS.
For Particulars apply to
JAMES DONALDSON,
Engineer and Secretary.

TO CHEMICAL MANUFACTURERS.

THE Directors of the Bexhill Water and Gas Company invite TENDERS for the purchase of the surplus TAR and LIQUOR produced at their Works for the Year 1898.
Tar, about 20,000 gallons; and Liquor, about 40,000 gallons.
Further Particulars can be obtained from, and tenders to be sent to, the undersigned, not later than the 15th inst.
FRED. RUSSELL,
Manager.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Six Months from the 1st of January next.
Delivery on Company's Works, filled into Purchaser's Tanks.
Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Friday, the 17th of December next; but the Directors do not bind themselves to accept the highest or any tender.
By order,
W. A. PADFIELD,
Engineer and Secretary.

CORPORATION OF BURY.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.
Forms of Tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer, Gas-Works, Elton, Bury.
Tenders, sealed and endorsed "Tender for Retorts," &c., to be sent to me not later than Monday, the 20th day of December, 1897.
JOHN HASLAM,
Town Clerk.
Bury, Dec. 2, 1897.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as they relate to DEBENTURE STOCK WILL BE CLOSED at Ten o'clock forenoon on Friday, the 10th inst., for the Half Year to Dec. 31, 1897, and will be RE-OPENED on Thursday, the 16th inst.
The Interest for the Half Year will be payable on the 1st of January next to the Proprietors registered on the closing of the Books.
By order of the Board,
JAMES RANDALL,
Secretary.
Gas Offices: Willoughby Lane,
Tottenham, Dec. 3, 1897.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS for the supply and erection of the STEEL WORK and CAST-IRON WORK required at the new Retort-House at the Gas-Works, Mulcture Hall Road, Halifax.
Specification, Form of Tender, and Print may be obtained on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.
Tenders, endorsed "Retort-House," must be sent to the undersigned before Ten o'clock a.m., on Wednesday, the 15th of December inst.
The person whose tender is accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
KEIGHLEY WALTON,
Town Clerk.
Town Hall, Halifax,
Dec. 2, 1897.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £100,000 THREE PER CENT. DEBENTURE STOCK.
MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE (created under the East London Water-Works Acts of 1894 and 1897), bearing Interest at 3 per cent. per annum, less Income-Tax, and redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.
Tenders must be delivered at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., not later than Eleven a.m., on Monday, Dec. 13 ensuing.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.
By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.
St. Helen's Place,
Bishopsgate Street, E.C.,
Nov. 18, 1897.

BROMLEY GAS CONSUMERS' COMPANY.

SALE BY AUCTION OF 400 ORDINARY SHARES OF £10 EACH.

THE Directors give Notice that they have instructed Messrs. BAXTER, PAYNE, and LEPPER to SELL BY AUCTION, at the Bell Hotel, Bromley, Kent, on Thursday, the 16th of December, 1897, at Eight o'clock p.m. precisely, 400 ORDINARY SHARES of £10 each, in the Bromley Gas Consumers' Company, in Lots of Five and Ten Shares.
The Dividend paid upon this class of Shares for the past Six Years, has been at the rate of 8½ per Cent. per Annum.
Particulars and Conditions of Sale may be obtained of the Secretary of the Company; Messrs. Willett and Latter, Solicitors, Bromley, Kent; and of the Auctioneers, Market Square, Bromley, and 69, King William Street, E.C.
By order,
HENRY WILLIAM AMOS,
Secretary.
Bromley, Kent,
Nov. 11, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.
He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards,
Offices: 18, FINSBURY CIRCUS, E.C.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

GAS—NO MORE MANTLES.
BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER. Perfect Light and Cheapness combined. 5s. 6d. Complete; Postage, 6d. extra. Lasts a Lifetime. Can be fixed to any existing Gas-Fittings. Gas-Fitters invited to see it; and Agents required.
Offices, where Samples can be seen (ROOM K),
17, GREAT TITCHFIELD STREET, W.

THE
"ETNA" FIRE & HEAT RESISTING
CEMENT,
For RETORT PURPOSES, is INVALUABLE.
Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.
Scores of Testimonials received. Write for Particulars.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke. . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

GAS PURIFICATION BY
HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.
ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

WOMBWELL MAIN COMPANY, LD.,
BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.
By R. O. PATERSON, C.E.

APPLY

WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

OIL FOR GAS MAKING
PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

18 & 19, GT. ST. HELEN'S, LONDON.

INDIA BUILDINGS, CROSS ST., MANCHESTER.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

EVESON FOR CANNEL

Telegrams:

"EVESON, BIRMINGHAM."

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY

RAVENSTHORPE, near DEWSBURY.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

BOGHEAD CANNEL OR TORBANEHILL MINERAL.

JAMES WOOD, LTD.,

Are the only Producers of the famous original

BOGHEAD CANNEL or TORBANEHILL MINERAL.

F.o.b. or c.i.f. Prices on Application to

28, ROYAL EXCHANGE SQUARE, GLASGOW.

THOMAS TURTON AND SONS, Limited,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton . .	10,500 Cubic Feet.
Illuminating Power . .	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD., NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

FIRE-BRICKS, FIRE-CLAY, & FURNACE CEMENT.

THE

FURNACE FIRE-BRICK CO., Ltd.

(Late JAMES WHITE & CO.)

WORKS:

Longcliffe, near Wirksworth, Derbyshire.

Manufacturers of

HIGH-CLASS FIRE-BRICKS, acknowledged to be the best obtainable for

GAS, IRON, AND CHEMICAL FURNACES.

For Analysis and Prices, address—

JAMES WHITE & CO.,

WIDNES, LANCASHIRE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	17·8 candles.
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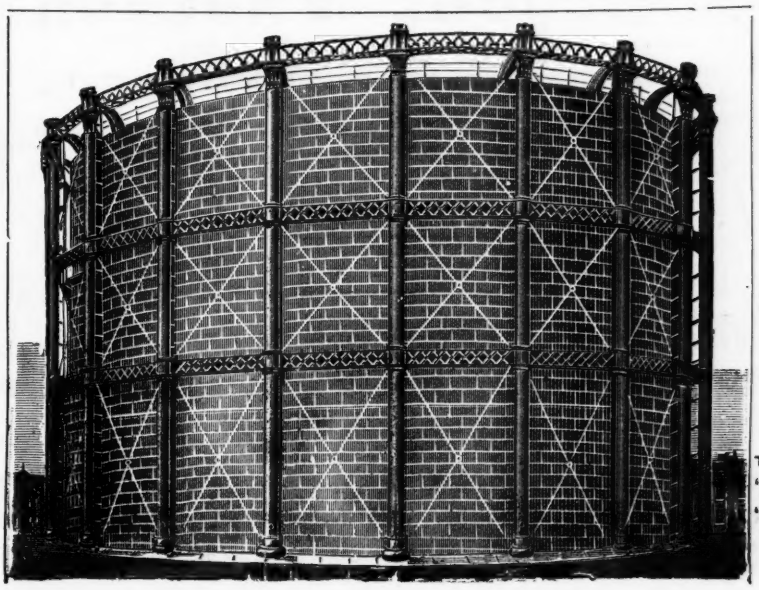

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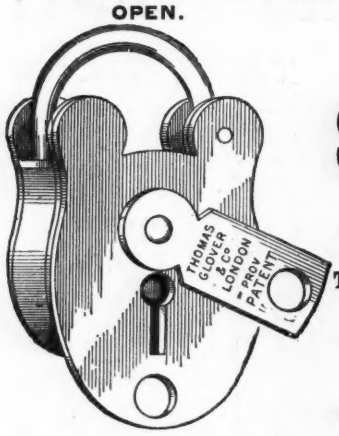

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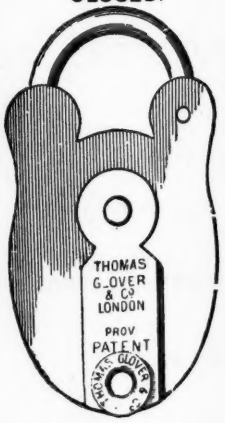

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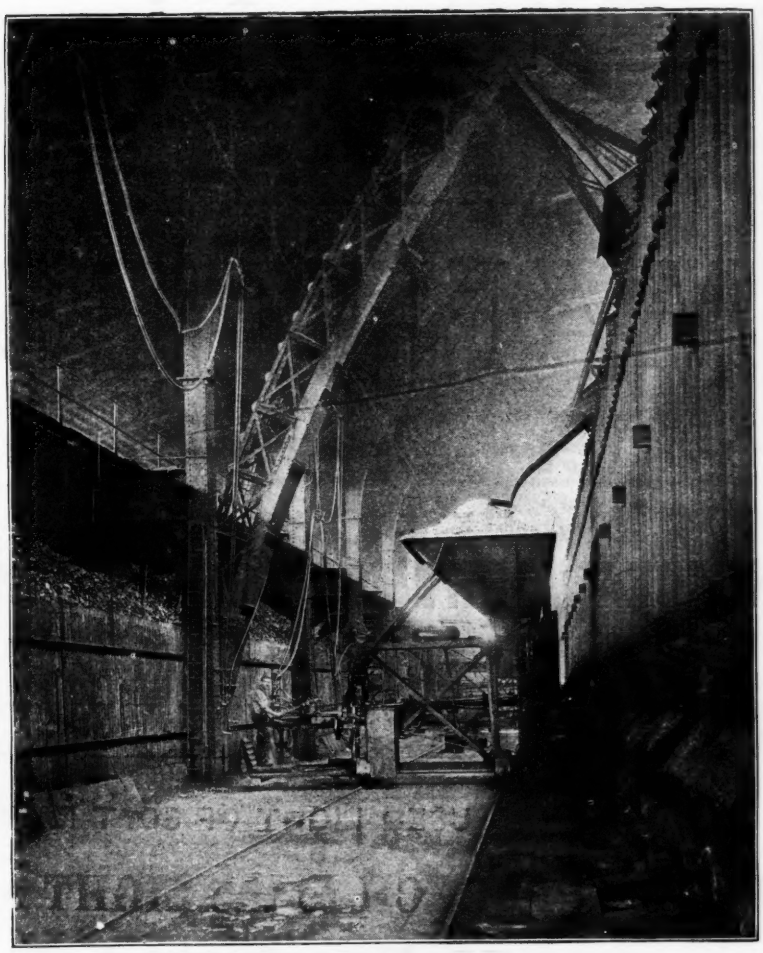

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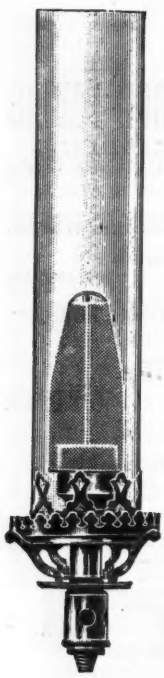

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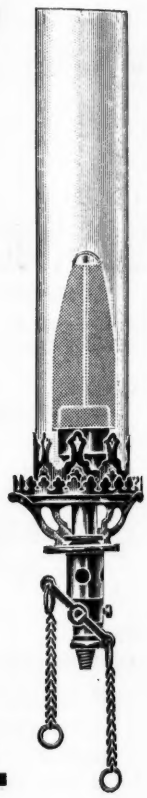

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ADVANTAGES.

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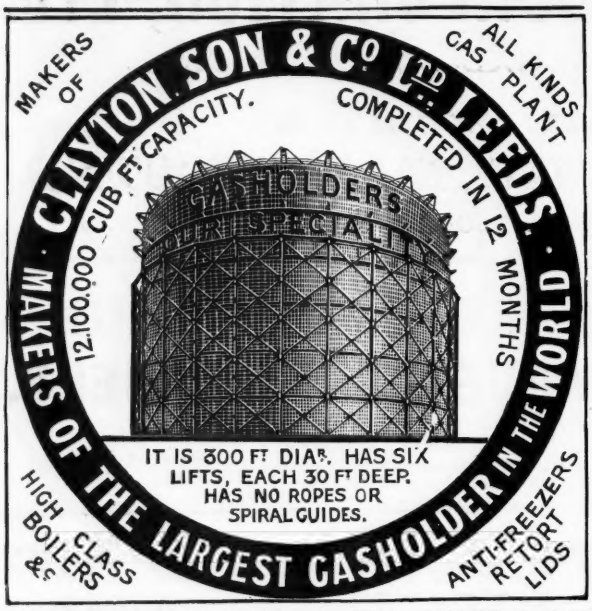
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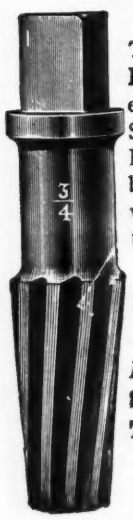

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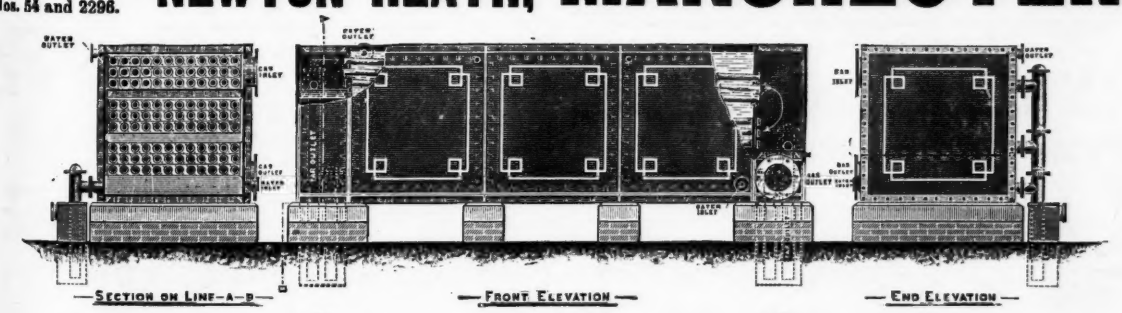

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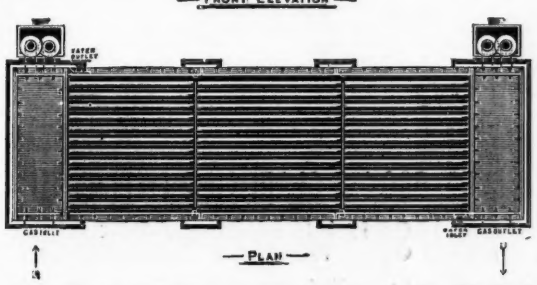

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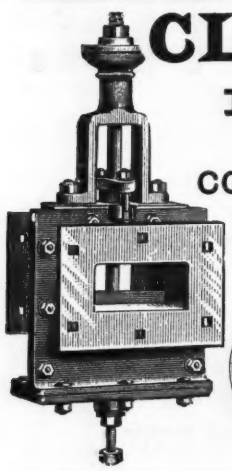

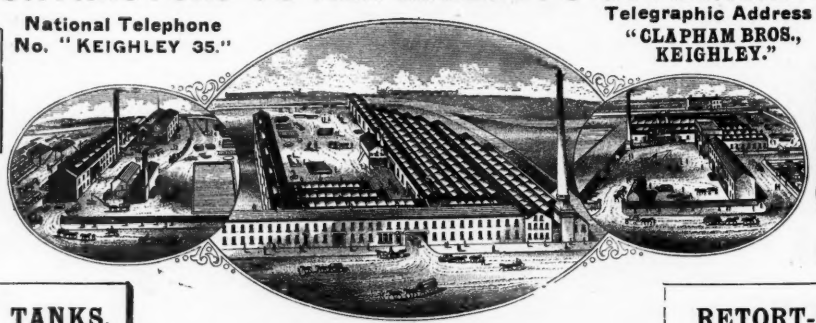

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